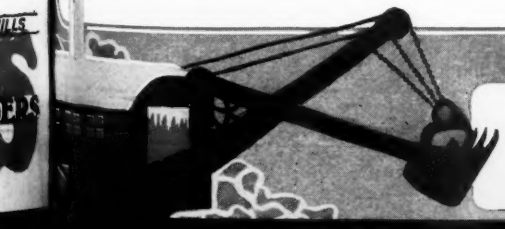
Pit and Quarry

SAND · GRAVEL · STONE
CEMENT · LIME · GYPSUM

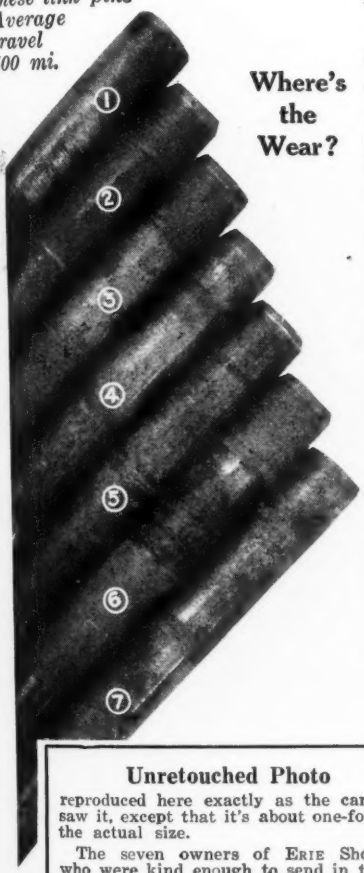


November 1, 1925

Circulation 7,600

Decide for Yourself!

OIL protected these link pins Average travel 500 mi.



Where's the Wear?

Maybe you have been badly puzzled—very much in doubt what to believe— when told that the link pins of a caterpillar type mounting should be run without oil.

And have asked yourself: "Can a dry steel bearing like that last anywhere near as long as an oiled bearing?"

Here's your answer. Just look at these link pins from 7 different ERIES, after traveling an *average* of 500 miles each (one of them more than 1,000 miles).

The average wear on these 7 pins has been exactly *one one-hundred-and-twenty-fifth (1/125) of an inch per 100 miles traveled.* Every roller and link-pin bearing of the ERIE caterpillar type mounting is automatically oiled, from internal reservoirs. This *complete lubrication* makes a big cut in your upkeep cost.

And most likely you've heard ERIE owners tell about the heavy high carbon steel tread links. They rarely need replacing— and the bearings have tempered spring steel bushings, completely protecting the link from being worn by the pin. *It costs only 50 cents to renew the bushings, instead of paying out $20 to $35 or more for a whole new tread link.*

This is just another striking example of the higher standard of construction that runs right through the ERIE Shovel. It's no wonder that ERIES cost only ⅓ as much for upkeep, as shown by the records of hundreds of owners.

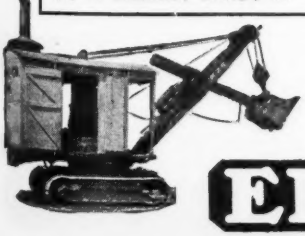
More than 3,600 ERIES in service.

Unretouched Photo

reproduced here exactly as the camera saw it, except that it's about one-fourth the actual size.

The seven owners of ERIE Shovels who were kind enough to send in these link pins for inspection are as follows:

(1) Commonwealth Improv. Co., Chicago, Ill.
(2) Matthew Ott & Co., Pittsburgh, Pa.
(3) Decker & Canning, Inc., Newark, N. J.
(4) T. M. White Co., Chicago, Ill.
(5) Latimer & Maloney, Washington, D. C.
(6) W. J. Hasley Co., Pittsburgh, Pa.
(7) A. Ramacitti, Chicago, Ill.



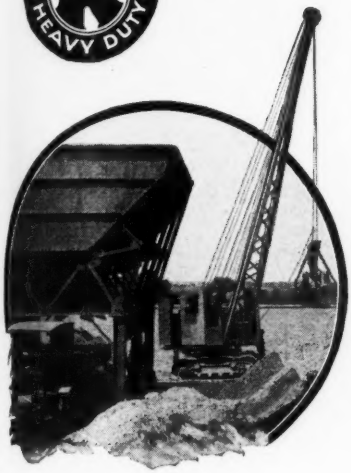
ERIE STEAM SHOVEL CO.
Erie, Pa., U. S. A.
Incorporated 1883
(Formerly Ball Engine Company)

Builders of ERIE Shovels, Cranes, Ditchers, Draglines, Trench Hoes, etc.

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago
Representatives throughout the U. S. A.

ERIE Revolving Shovels

KOEHRING Crane



HOISTING, peaking, sluing, propelling; accuracy, ease and speed depend on the clutches.

The Koehring double outside band friction clutches give a new smoothness and accuracy to every operation as well as *Finger-tip control* at the operating levers.

Far greater clutch friction area gives remarkable ease and flexibility in operation — without losing the "feel" of the load—contributes to faster operation as well as to low maintenance and the elimination of clutch troubles.

Koehring clutch bands tighten from opposite sides of the drum, operating through an equalizing device which does away with all binding or side thrust on drum or bearing!

Go over the Koehring from multiplane to boom peak—you'll find Koehring improvement in design, Koehring Heavy Duty construction giving new factors to speed of operation, dependability, low maintenance and long service life.

Write for Crane Bulletin No. Cr. 32

Crane Capacities

No. 1—¾ cu. yd. clamshell bucket on 40 ft. boom, standard. Lifting capacity, 10 tons at 12 ft. radius. 4 cylinder, 5"x6" gasoline engine, 1000 R.P.M.

No. 2—1 cu. yd. clamshell bucket on 45 ft. boom, standard. Lifting capacity, 15 tons at 12 ft. radius, 4 cylinder, 5¾"x7" gasoline engine, 1000 R.P.M.

KOEHRING COMPANY MILWAUKEE WISCONSIN

PAVERS, MIXERS—GASOLINE CRANES, DRAGLINES AND SHOVELS

Sales Offices and Service Warehouses in all principal cities

Foreign Dept., Room 1370, 50 Church St., New York City.
Canada, Koehring Company of Canada, Limited, 105 Front St., East, Toronto, Ontario
Mexico, F. S. Lapum, Cinco De Mayo 21, Mexico, D. F.

A 2785-III-IV

On Big Quarry Operation

This Model 206 P & H Gasoline Shovel, owned by F. W. Camp, a San Francisco contractor, is digging about 144 tons of crushed rock an hour for use in the Islais Creek project. The rock is first loosened with dynamite, after which the P & H shovels it into 4-ton trailers for transportation to the water front and there loaded in barges.

On this same operation a P & H Dragline, shown at the top of the hill, is equipped with a single line for raising and lowering the pile driver hammers which drive a 20-ft. drill into the rock.

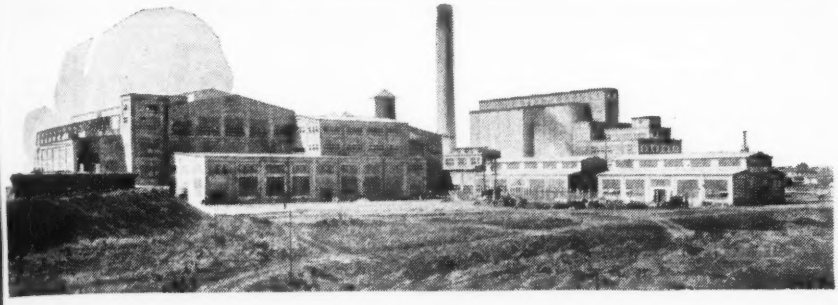
On large or small jobs of every description P & H excavating equipment can be depended upon to operate successfully with greater day-after-day output at lowest cost. Their sturdy corduroys have taken them into every state in the Union. Wherever you go, you'll find P & H.

Bulletin 82-X gives numerous typical applications and descriptions of features that have made P & H "the standard gasoline excavators of the world." Let us mail you a copy.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
Established 1884
3851 National Avenue **Milwaukee, Wis.**

Offices and Agents in Principal Cities
Warehouses and Service Stations:
Philadelphia Memphis Jacksonville San Francisco Los Angeles Seattle

P&H GASOLINE SHOVEL



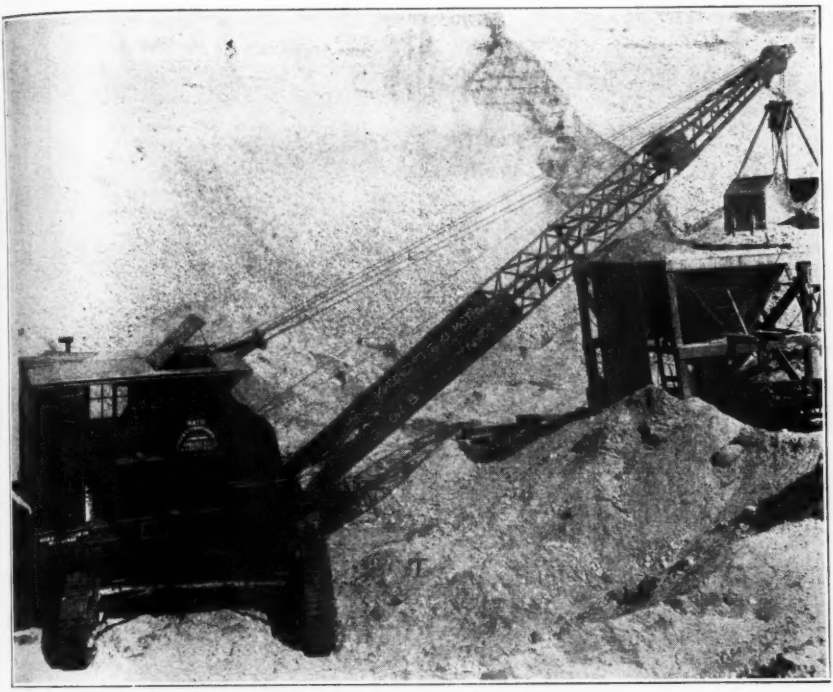
Elevators and Conveyors at the New Southwestern

THE Osborn plant of the Southwestern Portland Cement Company is a monument to the ingenuity and progressiveness of men who knew what they wanted. Mr. Carl Leonhardt and his associates are the most critical and exacting of plant builders; they know the best, and will be satisfied with no less. The result is that their new plant is remarkable in its equipment.

One outstanding feature of the plant is the system of conveyors and elevators, company-designed, and Jeffrey-built.

The 54-in. elevator shown, is one of the Jeffrey units. It has a capacity of 500 tons per hour and is a typical embodiment of Jeffrey quality in construction —a typical example of Jeffrey co-operation in design, where the ideas of Mr. Leonhardt were followed exactly.

We can serve you just as well— whether we manufacture from your own designs, or whether you desire our Experienced Engineers to lay out an equipment for you.



Wake up your gravel pit

There's but one way to make your gravel pit pay and that is *to get out the gravel.*

You can't do it with hand shovels or make-shift derricks, but you can with an Orton crane.

The one illustrated is a Type "E" Flexible Tread Crane with a 40 foot boom and 1 yard clamshell bucket, capable of handling 800 to 1000 yards of sand or gravel in an 8-hour day.

Perhaps you could double your output with the right kind of equipment. Put in an Orton Crane and wake up your gravel pit.

A Type "E" Flexible Tread Crane can be used with a clamshell or dragline bucket; also convertible into a 1 cubic yard power shovel, operated by a Trustworthy Climax Gas Engine and 1 man.

Write for a catalog or specifications and price of the Type "E" Crane.

ORTON & STEINBRENNER CO.

Locomotive Cranes, Flexible Tread Cranes, Gantry Cranes, Truck Cranes.

608 S. Dearborn St.
CHICAGO, ILL.

Clamshell Buckets, Orange Peel Buckets, Rock Crushers, Power Shovels.

Modern Massillon

Strong as a Bull

POWER
STRENGTH
SPEED
MOBILITY
LOW MAINTENANCE
ACCESSIBILITY
ENGINEERING ECONOMY
INTERCHANGEABLE REPAIRS

THE experienced digger understands value. If you want experienced testimony, ask Al. Geddes of New York, one of the famous Panama Diggers.

YOU know Al. Geddes. He is one of the many well known contractors who have found that the Massillon (¾-⅞-yd.) steam shovel possess all that is necessary for fast, economical digging—bull-like power, strength and speed.

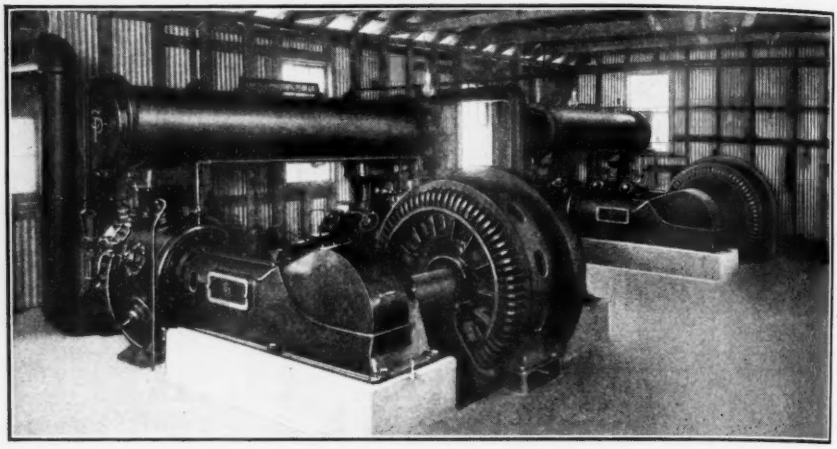
THE RUSSELL & CO.

MASSILLON, O.

(Established 1842)

The MODERN MASSILLON

Steam — ¾—⅞ RANGE — Shovel



CP Compressors
On New York's Newest Subway Contract

THE two Chicago Pneumatic two-stage synchronous motor driven Air Compressors shown above are supplying air for the Rosoff Subway Construction Company on the new 8th Avenue Subway, New York.

Reports from the job show that these CP Compressors are rendering excellent performance with high overall efficiency on 16 hour per day service. There are also three Chicago Pneumatic Portable Compressors in service to meet the constant demands for mobile air power.

This section calls for the excavation of ten city blocks through solid rock, with a maximum depth of 18 feet. To assure completion of the contract with greatest possible efficiency CP Equipment is being used throughout—including CP-10 Rock Drills, BQ-46 Pavement Breakers, Hose, Steel, etc.

Let us send you full information on CP Compressors, which are built in steam, oil, belt and direct motor driven types to meet all compressed air needs, and on other CP Equipment suited to your needs.

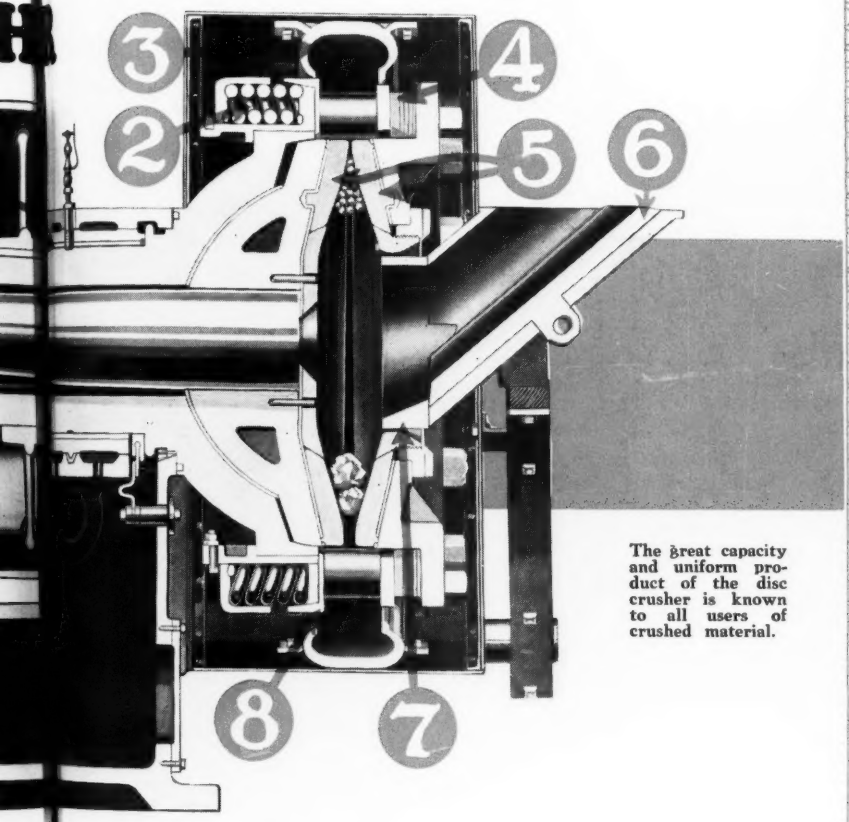
C-203

Chicago Pneumatic Tool Company

Sales and Service Branches all over the world

6 East 44th Street, New York, N. Y.

EW FEATURES



The great capacity and uniform product of the disc crusher is known to all users of crushed material.

up wear and

and O… changeable less …te.

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7. Manganese Feed Spout renewable end.
8. Renewable angle wearing ring.
9. Spring oil wipers—no oil leakage.

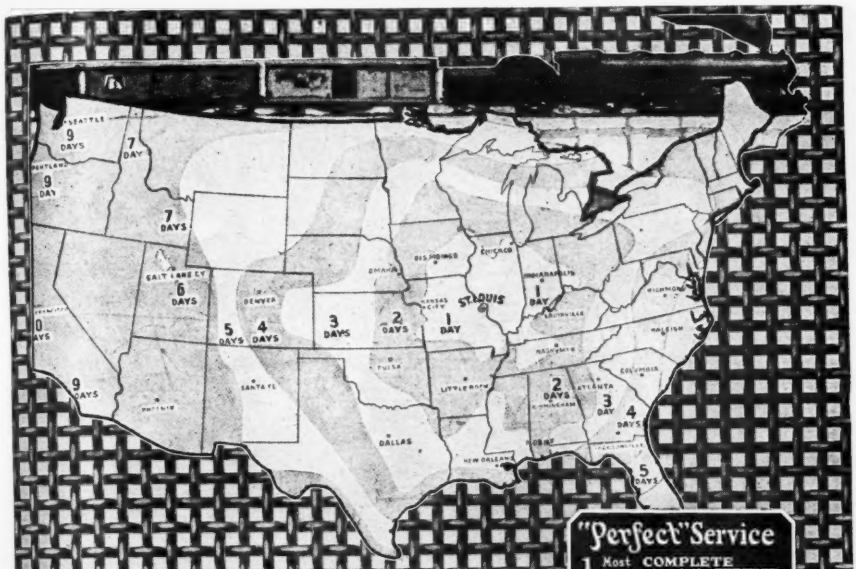
…nished when desired at reasonable additional cost

…HERS CO.

AN…EL CRUSHERS

GE BU… MILWAUKEE, WIS.

NEW YORK OFFICE
120 BROADWAY



"Perfect" Service

1. Most **COMPLETE** wire cloth **SERVICE**
2. Most **ACCESSIBLE** wire cloth **SERVICE**
3. Most **RELIABLE** wire cloth **SERVICE**
4. Most **ADAPTABLE** wire cloth **SERVICE**
5. Most **ECONOMICAL** wire cloth **SERVICE**

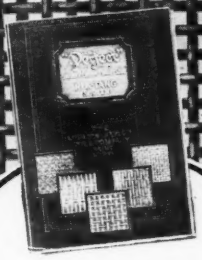
Time in Transit for Wire Cloth Shipments by Package Car from St. Louis

(Regular Freight Charges—No Extras)

City	Days	City	Days
Albuquerque, N. M.	5	Lincoln, Nebr.	3
Atlanta, Ga.	3	Little Rock, Ark.	2
Austin, Texas.	4	Los Angeles, Cal.	9
Baltimore, Md.	4	Louisville, Ky.	1
Birmingham, Ala.	2	Macon, Ga.	4
Boston, Mass.	4	Memphis, Tenn.	2
Butte, Mont.	6	Mobile, Ala.	2
Cairo, Ill.	1	New Orleans, La.	3
Chattanooga, Tenn.	2	New York City, N. Y.	3
Chicago, Ill.	1	Omaha, Nebr.	3
Cincinnati, O.	1	Philadelphia, Pa.	3
Cleveland, Ohio.	2	Pittsburgh, Pa.	2
Columbia, S. C.	4	Portland, Oregon.	9
Dallas, Texas.	3	Richmond, Va.	4
Denver, Colo.	4	Salt Lake City, Utah	6
Des Moines, Iowa.	1	San Antonio, Tex.	4
Detroit, Mich.	2	San Francisco, Calif.	10
El Paso, Texas.	5	Seattle, Wash.	9
Ft. Wayne, Ind.	1	Sioux Falls, S. D.	4
Ft. Worth, Texas	3	Shreveport, La.	3
Houston, Texas.	4	St. Paul, Minn.	3
Indianapolis, Ind.	1	Terre Haute, Ind.	1
Jackson, Miss.	3	Tulsa, Oklahoma.	2
Jacksonville, Fla.	4	Washington, D. C.	4
Jefferson City, Mo.	1		
Kansas City, Mo.	1		

—and **Express** arrives in half the time!

Package Car Delivery from St. Louis over twenty-six great Railway Systems, **puts us nearest to your needs.**



Our Screen book brings **complete Screen Service** to your desk.

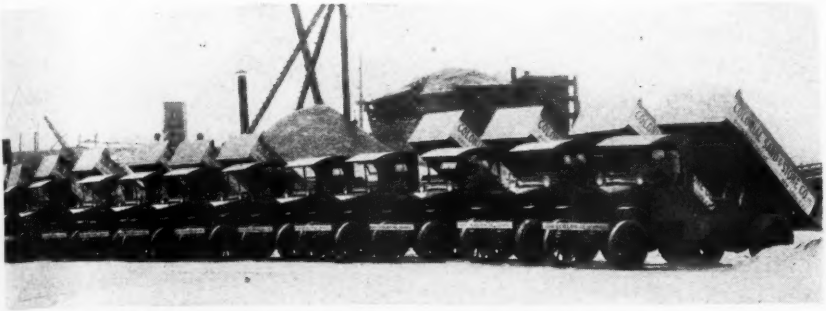
This Text-book gives all information on the Thousand Ludlow-Saylor Woven Screens.

The comprehensive tables, with hundreds of actual-size illustrations, make complete, reliable screen data instantly available.

Send for your copy of Catalog No. 47-E. Free to users of Screens.

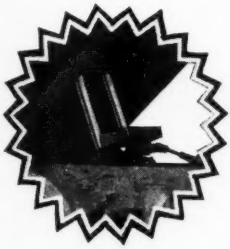
The city surrounded by the United States

The LUDLOW-SAYLOR WIRE COMPANY St. Louis



Heil Excavating Bodies mounted with Heil Hydro Hoists on Pierce-Arrow trucks. The capacity of each of these bodies is 162 cu. ft. Part of the fleet of fifty-three is shown above.

Heil Equips Monster Fleet



Twin Cylinders Twice the Power

The Heil Hoist with its TWIN cylinders and TWICE the power can lift the heaviest loads your trucks can carry to the highest dumping angles. No danger of side-sway or back tipping.

The Heil Hoist occupies no loading space, is easy to mount, and easier to operate. Two levers in the cab control the raising and lowering of the hoist—it can be held at any dump angle.

Quality TANKS BODIES & HOISTS "Made by Heil"

FIFTY-THREE new trucks recently added to the Colonial Sand and Stone Co. fleet of New York have been equipped with Heil Steel Dump Bodies and Heil Hydro Hoists. Colonial specified Heil because of the successful performance of Heil Bodies and Hoists in the service of hundreds of other sand and gravel operators in the United States.

Colonial takes pride in the appearance of its dumpers. The trim neatness of Heil Body design lends itself well to distinctive lettering and painting. Why not put a Heil Unit in your service?

Send the coupon in for prices and literature on all Heil Equipment.

THE HEIL CO.

1139-75 Montana Ave. Milwaukee, Wis.

One of Our Twenty-five Distributors is near You.

The Heil Co.,
1139-75 Montana Ave., Milwaukee, Wis.
Please send your Catalog on Heil Dumps to—

Name .....

Address .....

City .....

The Auto Truck Scale that stays accurate

The only scale that will safeguard you against the heavy losses of inaccurate weighing is the scale that not only *is* accurate but *stays* accurate.

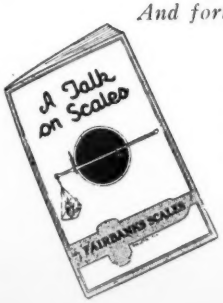
There is never any question about the accuracy of the Fairbanks Type "S." The principles of design employed in this scale were first proved in railroad track scale service—the heaviest, most withering service that a scale can be subjected to. Its record of unvarying accuracy in railroad service was again repeated under the trying conditions of large capacity grain hopper scales, and now this firmly established principle is setting new standards of accuracy in the Type "S" Auto Truck Scale.

Still more important, the use of rust-proof moving parts and precision in every construction detail assure absolute accuracy throughout the unequaled life of the scale.

Our representative will be glad to give you facts and figures. Or mail the coupon for the interesting book, "A Talk on Scales."

FAIRBANKS SCALES

Chicago, 900 South Wabash Avenue
New York, Broome and Lafayette Streets
And forty other principal cities in the United States



The coupon will bring this booklet full of scale information which every scale owner should have.

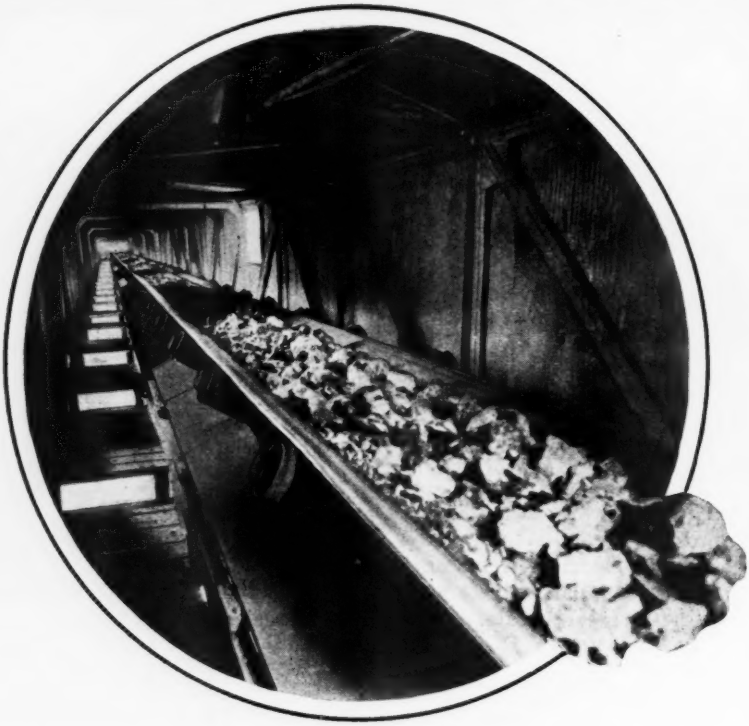
(Mail to office most convenient)

Fairbanks Scales, Dept. S-B-11,
900 South Wabash Avenue, Chicago.
Broome and Lafayette Streets, New York.

Please send your booklet, "A Talk on Scales," also Type "S" specifications and full information about the economy of Type "S" Scales in weighing motor trucks.

Name .....

Address .....



Handling Materials With Webster Belt Conveyors

Economical in both initial and operating expense, Webster belt conveyors offer a solution to many handling problems in the rock products industries. Well designed and ruggedly constructed, assures years of dependable, low cost service.

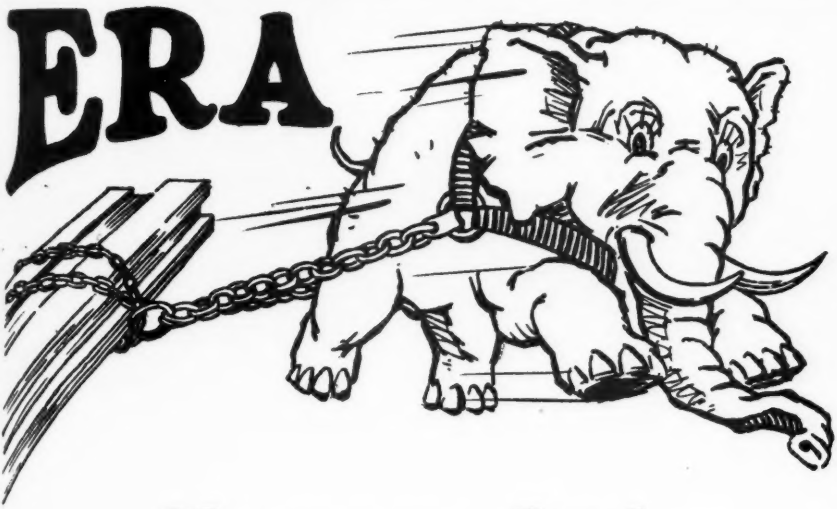
Manufactured in a wide range of capacities and in many different styles, with plain grease cup bearings or roller bearings.

Webster engineers are at your service to help you in your material handling problems. Consult them.

THE WEBSTER MFG. COMPANY

4500-4560 Cortland Street
CHICAGO

WEBSTER



Manganese Steel

Heavy, Shocking Strains

"Era" Steel is the answer to your excessive repair bills where unusual strains or abrasive action are to be contended with. With it you can eliminate breakdowns, speed up contract work, and make more money. A standard quality at a standard price. Wire us for further information.

Hadfield-Penfield Steel Company
BUCYRUS, OHIO

ERA

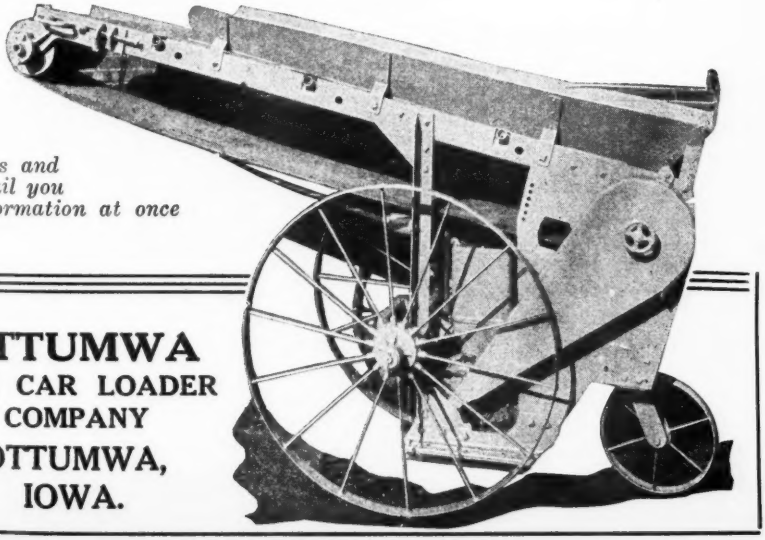
Cut Your LOADING COSTS in Two—

The Ottumwa Box Car Loader will do it for you, just as it is cutting loading costs for many other up-to-date shippers. Just one man is required to adjust the

Ottumwa Box Car Loader

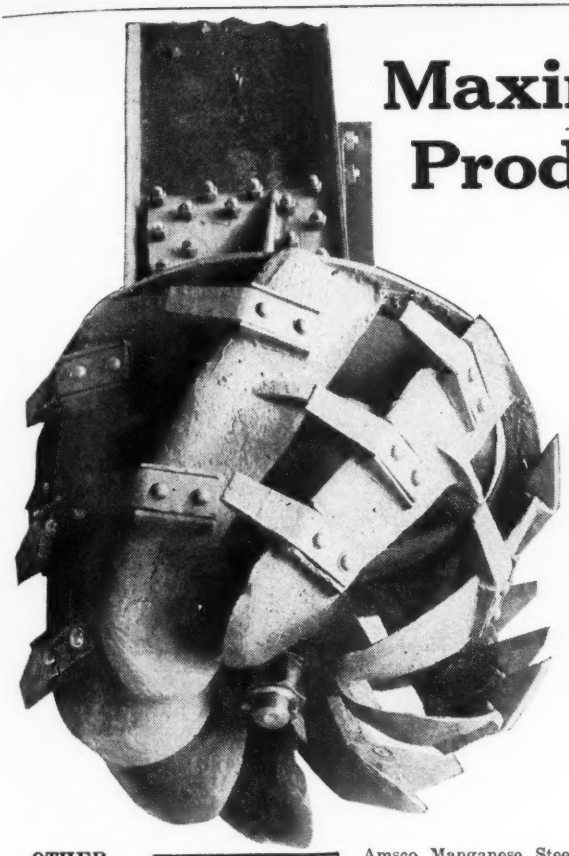
and one Ottumwa will load a big car in a fraction of the time taken by other methods or by a loading gang. Two adjustments—one each for the two ends of the car—are all the attention it needs until the job is finished.

The Ottumwa Loader cuts your costs in two because it eliminates the loading gang, prevents delays, increases capacity, and loads with tireless energy. It has roller or ball bearings throughout, latest Alemite greasing system, and is operated by electric or gasoline power.



Write us and we'll mail you full information at once

OTTUMWA
BOX CAR LOADER COMPANY
OTTUMWA, IOWA.



Maximum Production!

Minimum Cost!

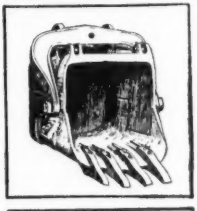
AMSCO

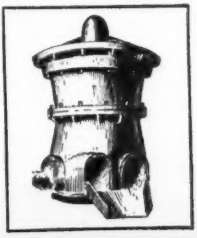
Manganese Steel

Revolving Cutter Heads

OTHER **AMSCO** PRODUCTS

Sand and Gravel Pumps, Pump Shells, Liners, Side Plates, Impellers, Dippers, Dipper Teeth, Power Shovel Parts, Jaw Plates, Check Plates, Crusher Parts, Concaves, Wearing Plates, Chain Sprockets, Gears, Pinions, Wheels, Sheaves, Elevator Buckets.





Amsco Manganese Steel Revolving Cutter Heads have demonstrated under unusually difficult service the excellence not only of their design but of their metal. Under the most favorable circumstances the wearing action on cutter heads, whose operation is to cut and agitate the material to be pumped, is severe.

The shocks and stresses from boulders encountered tend to break ordinary castings. In this application, as with Amsco Manganese Steel Pumps, only the strength, ductility and toughness of Manganese Steel can adequately combat the severe conditions encountered.

Other Amsco parts for dredges of equal durability are Flap Valves, Elbows, Pipe, Pipe Flanges and Drive Gears; also the Swintek Traveling Screen, used on the Swintek Traveling Suction Nozzles.

AMERICAN MANGANESE STEEL CO.
General Offices: 388 E. Fourteenth St.
Chicago Heights, Ill.

Foundries: Chicago Heights, Ill.; New Castle, Del.; Oakland, Cal.; Los Angeles, Cal.; Denver, Colo. Southern Manganese Steel Co., St. Louis, Mo.

AMSCO

TRADE MARK REGISTERED

Pit and Quarry

Index to Advertisers

Vol. 11 CHICAGO, ILL., NOVEMBER 1, 1925 No. 3

The Pacific Coast Cement Company Is One of the Big Users of IXL Speed Reducers

THERE is an interesting article in this issue of Pit & Quarry on the plant of the Pacific Coast Cement Company that mentions the use of IXL Speed Reducers in stepping down speeds.

There are some features that all cement plants will be interested in concerning these efficient money saving reducers that will materially cut down cost, save space, save replacement and eliminate accident hazards in cement mills.

1,600,000 FEET OF BELTING.

Last year this enormous amount of belting was worn out and replaced in the cement industry, to say nothing of worn out gearing, shafting and hangers. Undoubtedly in your plant you will be interested in reducing speeds with this compact, efficient unit that eliminates belting chains and open gearing—space saved and an immense amount of money saved that now goes into replacements.

DIRT AND DUST PROOF.

Dust and dirt in the cement mill takes heavy toll on exposed and open gearing. Longer life is insured in your speed reduction equipment by the use of IXL Speed Reducers that are completely encased and are running in a bath of oil. There is not a pin hole for dirt and dust to get in and wear out the mechanism.

WHERE THEY CAN BE USED.

Slurry mixers, rotary kilns, agitators, clay sumps, wash mills, elevators, screw belt, drag and bucket conveyors and also for all machinery in lime quarrying, gypsum and gravel industries.

Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

Vol. 11 CHICAGO, ILL., NOVEMBER 1, 1925 No. 3

FEATURE CONTENTS

Pass it on

President . . . . . .

Vice-Pres. . . . . . .

Secretary . . . . . .

Treasurer . . . . . .

Gen. Mgr. . . . . . .

Sales Mgr. . . . . . .

Traffic Mgr. . . . . . .

Engineer . . . . . .

Supt. . . . . . .

Foreman . . . . . .

Purch. Agent . . . . . .

COMPLETE SERVICE PUBLISHING CO.
Rand-McNally Bldg., Chicago, Ill.

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HAROLD W. MUNDAY
Editor

Associate Editors
E. D. ROBERTS
GEORGE B. MASSEY

This Conveyor Grew Up

The picture above, shows a Barber-Greene permanent Conveyor in the washing plant of Homer J. Holl, N. Canton, Ohio.

This full fledged permanent conveyor grew up from a Barber-Greene portable. You can notice, in the pictures, that the swivel wheels and the conveyor frame supports have not been removed.

Even the original two cylinder engine has been retained, though on this account, the belt speed has been reduced.

In spite of this the outfit can handle 250 yards per day without being overworked.

There are several important things about Barber-Greene Conveyor construction that make such tricks of adaptibility possible.

The conveyor frame is built up of standardized sections. These sections may be added, rearranged, to provide practically any desired conveyor length.

In addition Warren Truss construction combines rigidity and strength with the exceptionally light weight that makes for convenience.

Other Barber-Greene Conveyor units have also been standardized. It is no trick to change and interchange. And Barber-Greene Portables and Permanents can be added to, and subtracted from, as conditions demand.

That's what happened to the conveyor pictured, and it grew up.

How Barber-Greene layouts are worked out to meet individual handling needs is shown in our latest Mr. Barber's Scrapbook. Send for a copy. It's free.

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Portable Belt Conveyors Self Feeding Bucket Loaders

Coal Loaders Automatic Ditch Diggers Coal Feeder

Pit and Quarry

Vol. 11 Chicago, Ill., November 1, 1925 No. 3

Atlanta and Montreal Next

MONTREAL, CANADA, has been selected as the city for the next convention of the National Crushed Stone Association to be held during the week of January 18, 1926. Convention headquarters will probably be at the Mount Royal Hotel. Announcement was made several weeks ago that the National Sand and Gravel Association would hold its next convention at Atlanta, Georgia, January 13 and 14, 1926. Convention headquarters at Atlanta will be at the Atlanta Biltmore Hotel. Both associations have taken steps this year which assure the next conventions being of great importance to their respective groups. It is expected that both conventions will be the largest in attendance and the most productive of effective results of any previous gatherings. Both cities afford many interests to prospective attendants and we will cite a few facts and personal impressions here.

Montreal, the largest city and the commercial metropolis of the Dominion of Canada, is situated on the Island of Montreal, formed by the mouths of the Ottawa River which empties into the St. Lawrence River. Montreal is built on the south side of the Island. Behind the city rises Mount Royal (Mont Real), from which it derives its name and part of which is reserved as a public park.

Montreal was founded under the name of "Ville Marie de Montreal" in 1642 on the site of the Algonquin Village, Hocheloga, by Sieur de Maisonneuve. It came into the hands of the English in 1760 when it was taken from the French by General Amherst. It was the seat of the government of Lower Canada until 1849, in which year it was superseded by Quebec.

Montreal is governed by a Municipal Council consisting of a Mayor and about 35 Aldermen who are elected every two years. From the Aldermen an Executive Committee of five who have powers similar to those of the executive of a legislature. The Municipal Council appoints a Director-in-Chief who works under the jurisdiction of the Executive Committee.

The bank clearings of Montreal are averaging at the present time $150,000,000 a week. This is exceeded by only New York, Chicago, Boston and Philadelphia. Montreal is in fact the financial center of Canada. Eleven banks have their head offices here, together with over 250 branches. It is also the commercial metropolis of Canada and numerous manufacturing concerns maintain their headquarters here. It is the railway and shipping center of Canada. The Canadian Pacific Railway has its headquarters here. It is also a terminal point for the Grand Trunk, Canadian National and several American Railways.

The port of Montreal is the second largest on the entire American Continent. Ocean vessels come up to Montreal during the summer season. Merchandise to the extent of more than 300,000,000 tons imports and nearly the same amount of tons exports are handled annually. There are grain elevators with a storage capacity of approximately 9,000,000 bushels of grain. The Harbor is governed by a commission of three. Docks and wharves extend for a distance of seventeen miles. The City of Montreal covers an area of 50 square miles, part of which is preserved as a public park. Every part of the city can be reached by surface cars. The Montreal area

has a population of 1,000,000 people. Of this population, between 60 and 65 per cent are of French descent.

Montreal is called the City of Churches of which Notre Dame Cathedral is the largest. This church is the second largest on the American Continent. St. James Cathedral on Dominion Square is an exact duplicate of St. Peters in Rome and one-third the size of the original. Christ Church Cathedral has been designated by many experts as the finest specimen of pure Gothic architecture on the American continent. St. James Methodist Church was built by contributions from Methodists all over Canada.

The hotels of Montreal, in our opinion, compare favorably with the others of cities of similar size. The three leading hotels are the Mount Royal, the Ritz Carlton and the Windsor.

The selection of Montreal for the National Crushed Stone Convention was by a large majority of the Board of Directors. It was a wise choice because the facilities are ideal for conventions and the winter sports during January are something not equalled by any other city on the American Continent.

Atlanta, Georgia, is located in the Piedmont Plateau region of northern central Georgia, near the Chattahoochee River. The city was founded in 1843, at the then southern terminal of the Western and Atlanta Railroad. In its early days the town was known as Terminus. Eventually the name Atlanta was chosen and as such the city played a prominent part in the Civil War.

Atlanta is the capital of the State of Georgia. It has an elevation of 1,050 feet above sea level and in this respect is the highest city of its size in the United States east of Denver. Numerous railroads enter Atlanta among which are: The Southern; Central of Georgia; Georgia Seaboard Air Line; Nashville, Chattanooga and St. Louis; and the Louisville and Nashville. The city was originally laid out in the form of a circle with a radius of 1¾ miles and the center at Union Depot. Large additions have of course been made beyond this circle. The present population is about 230,000 of which the Negro population constitutes 61,000. The annual mean temperature of the city is 61 degrees Fahrenheit ranging from minus 2 degrees in winter to 100 degrees in the summer. The relative humidity averages about 66 per cent for the year. Atlanta is known for its excellent sanitation facilities. It has 424 miles of water mains and its own sewage disposal plant. The death rate in 1920 was 18.2 per thousand. The annual bank clearings average about $3,500,000,000. There are more than 500 manufacturers in the city producing products of an aggregate value in excess of $200,000,000.

Atlanta has several excellent golf courses. Visiting golfers from clubs affiliated with the United States Golf Association are permitted to use the Atlanta Golf and Country Clubs. The old homeplace of "Uncle Remus" familiarly known as the "Sign of the Wren's Nest," the residence of Joel Chandler Harris, famous writer of children's stories, is located in the West End of Atlanta. Grant Park embraces part of the scenes of the Battle of Atlanta. It is a beautiful shaded park covering 144 acres. Georgia School of Technology is situated in Atlanta. So is Oglethorpe University which is a restoration of the "before the war" Oglethorpe University which expired soon after the Civil War.

There are several hotels in Atlanta. Among the leading hotels are Atlanta Biltmore, Georgian Terrace, The Piedmont and The Cecil. The new six million dollar Atlanta Biltmore will be convention headquarters. This hotel is one of the finest in the country. About 350 conventions are held in Atlanta each year. It is easy to predict that the coming convention of the National Sand and Gravel Association will be the largest from the standpoint of attendance of any previous gatherings and present signs indicate that it will not fall short in its value to those in attendance.

Both the National Crushed Stone Association and the National Sand and Gravel Association have made progress of far reaching effect during the past year. Scientific research has bene recognized and will be undertaken by both associations with such a program as only a large body could maintain. Both associations will render service during the coming year which no single company could afford to provide for itself individually. These associations represent coordination of interests and activities for the benefit of their entire membership. Affiliation is worth while and should be considered in time for attendance at the coming conventions.

Producing High Grade Portland Cement From Unusual Raw Materials

By E. D. Roberts

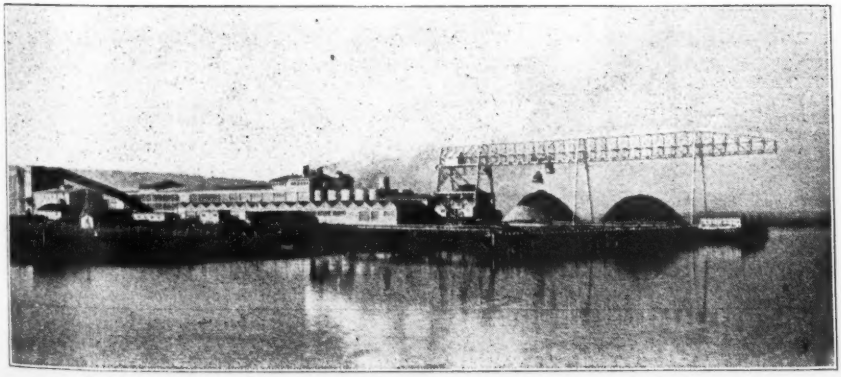
PRODUCTION of a high grade portland cement from raw materials which have been pumped from the bottom of San Francisco Bay has placed the Redwood City plant of the Pacific Portland Cement Company Consolidated in a class by itself. The raw materials consist of oyster shells and clay. To produce this cement without a trace of stack dust is an added feature which calls for special attention in these columns.

Arriving at Redwood City and having been told that the plant was opposite the town on the bay, I scanned the horizon for the usual telltale stacks. Finding none, I hailed a taxi and asked to be taken to the cement plant. In a few minutes we arrived at the plant office, where my first remark was an inquiry as to why they were "down." I was informed that they were running full blast all of the time, but due to the Cottrell dust precipitator, there was no visible evidence that the plant was running.

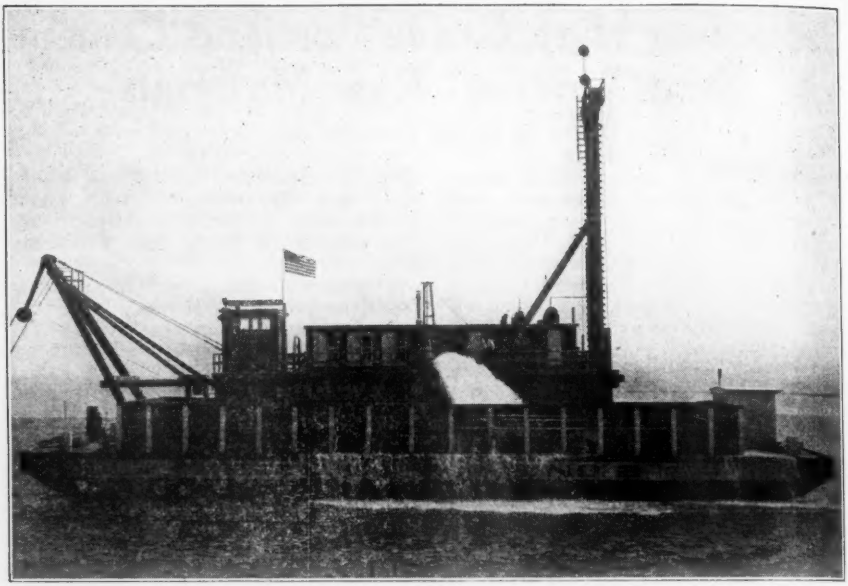
Our first trip was out to the dredge where the raw materials are secured, which at present is working about four miles from the plant. The company owns extensive shell and clay deposits in the bay, which have been tested by borings at regular intervals, showing a layer of oyster shells from 12 to 30 feet in depth. Most of it is just under the water at low tide. These oyster shells are nearly pure carbonate of lime. The clay contains the silica, alumina and iron. These shell and clay beds comprise about 30,000 acres covering practically the entire floor of south San Francisco Bay.

The shells and clay are pumped from the bottom of the bay by a suction dredge which was specially designed for this purpose and built by the Union Iron Works of San Francisco. A 110 H.P. Atlas diesel engine operates a rotating cutter located at the end of the suction pipe. The cutter and suction pipe are swung back and forth in the arc of a circle. The dredge steps ahead of two spuds located at the rear end of the dredge. A 170 H.P. Atlas diesel engine operates a 16 inch centrifugal pump which sucks in the material loosened by the cutter and discharges it into a barge located alongside the dredge. This pump throws 10,000 gallons of water and material per minute. One hour of such pumping will place 450 tons of shells and clay in the barge.

Four barges of materials are required per day, but the work is arranged to give the crew no work on Sunday; calling for an output of five barges for most of the 8 hour working days. These barges are towed to the plant by a tugboat in pairs. These barges have a capacity of 500 tons, although the usual load is not quite up to that amount. A scow, equipped with a donkey engine for handling the outlying dredge anchors,



The Redwood City Plant of the Pacific Portland Cement Company Consolidated



The Specially Built Dredge

is part of the dredging equipment. Eight men comprise the total personnel of the dredge crew, including all hands and the cook.

The barges are unloaded at the plant by a Pawling and Harnischfeger overhead electric crane equipped with a four yard Brownhoist clamshell bucket. The travel tracks for this crane are 68 feet above the ground and extend horizontally 340 feet. The crane operates on an overhead stationary bridge of structural steel construction. The shells are dumped directly into one of three 400 ton steel hoppers or into one of two large concrete storage silos. These silos are 80 feet in diameter by 30 feet deep. They extend barely above the ground, to give extra storage below the bucket clearance. The crane is operated two eight hour shifts per day.

Double screw feeders are placed under each hoppered bin to draw off the raw material. In case it hangs up, a stream of water around the edge breaks it loose, the shells causing the material to stand at 90 degrees at times. The feeders discharge into a trough in which a 16 inch screw con-

Tugboat Handling Barge of Shells

veyor is operating, lifting the material through a small elevation. This lift is provided so that water may be turned in at the discharge end to wash out some of the clay in case a high lime silo is desired. General Electric motors with Foote IXL speed reducers furnish the drive for the feeders and conveyors to the mills.

The material, all of which has been dredged from the bottom of the bay, is now ground to slurry by three number 726 three stage Allis-Chalmers compeb mills discharging into a common sump. This slurry contains about 40 per cent water. A 3 inch Wilfley or an Allis-Chalmers air lift pump delivers the slurry into the desired slurry tank. These tanks are of reinforced concrete construction, 18 feet in diameter and 40 feet deep. The slurry is kept in agitation by means of 6 pipes placed in the bottom of the tanks discharging compressed air into the mix under a 75 pound pressure. There are 15 of these slurry tanks used for correction which have piping so arranged that another Allis Chalmers air lift pump may draw from any tank and discharge into one of the mixing tanks. After thorough mixing, it is pumped into the kiln feed tanks from where it is pumped into the kiln feeders. These feeders are the Allis Chalmers ferris wheel feeder. More material than is needed is pumped, the excess running back into the kiln feed tank in a steel trough.

There are two kilns, each 10 feet in diameter by 235 feet long supported on four tires. Each kiln is driven by a 100 h.p. variable speed General Electric motor using belt and gear speed reductions. LaClede Christie fire brick are used for lining the kilns. Oil meters are installed in the oil feed lines to the burner which is fitted with a General Electric centrifugal blower. Each blower is operated by a 75 h.p. General Electric motor and discharges into a common pipe which has a branch to each kiln. A Brown recording pyrometer records the temperature at the feed end of the kiln, which ranges from 800 to 900 degrees Fahrenheit.

The oil is stored in a large steel tank having a capacity of 25,000 barrels. The oil is barged directly from the tank farms located on the Bay. The shipping dock is equipped with piping and pumps to handle the oil from the barges directly into the tanks.

The clinker falls from the kiln into an 8x60 foot cooler placed in line with the kiln. After passing through the cooler the clinker may be picked up in the bare hands. Both kilns and coolers were furnished by the Allis Chalmers Manufacturing Company.

The cooled clinker falls into a Link Belt Peck carrier which handles it to the clinker bin or outside storage. Very small outside storage is counted on, however, as the market requires cement throughout twelve months of the year. A Merrick weightometer placed in the line of the carrier weighs all of the clinker. Readings are taken at the end of each 8 hour shift so that an accurate record can be made of the amount of clinker turned out by each burner.

The gypsum comes in bottom dump cars which are spotted on a trestle with a hoppered bin constructed underneath. The gypsum is dropped into this bin and drawn off onto a belt conveyor which operates under the bin carrying the gypsum to a cross belt which carries it to an elevator which raises it to the top of the mill building. The elevator discharges into a screw which distributes into either of the gypsum bins desired.

These gypsum bins are located alongside the clinker bin for convenient gravity feed to the dry mills. Allis Chalmers feeders on the gypsum and Gates feeders on the clinker control the feed to the number 726 Allis Chalmers two compartment compeb mills, of which there are two, for the finish grinding. Each mill is driven by a 500 h.p. Allis Chalmers synchronous motor through a Cutler Hammer magnetic clutch. Each compeb mill is fitted with a 14 foot Gayco centrifugal separator. These separators sort out the fines from the compeb mill discharge and return the coarse particles for more grinding. This method allows greater forcing of the mills with consequently greater output.

The fines from the Gayco separator drop through a pipe to a common screw conveyor which carries the finished cement to the stock house for elevating and distribution to the silos for storage. The coarse particles from the separators are piped to the elevator carrying the clinker to the clinker bins, discharging therein.

Finished cement silos constructed of reinforced concrete have a total capacity of 75,000 barrels of cement. The bag and packing house is also of reinforced concrete construction with

Looking From Redwood City Across The Bay

facilities for easy handling of the sacks. A 25 h.p. motor drives an automatic bag cleaner through a Foote IXL speed reducer. The cleaned sacks come out of the bag cleaner on a belt from which they are sorted and piled by the operators. The sorted sacks are trucked to an elevator which carries them to the desired floor above from which they are chuted to the scaling machine after mending and tying. There is a cyclone dust collecting system in operation in all parts of the bag house which keeps the place clean and air breathable.

Three 3 tube Bates packers sack the cement which has been drawn from the bins, elevated and conveyed to reinforced concrete bins, the bottom of which forms the ceiling of the packing room. These sacking machines discharge onto reversible belts so that shipments may be made from either side of the building. The left machine has a belt serving the motor truck trade on that side of the building, while the other two serve the car shipments made on the right side of the building. When these belts are reversed, they both carry the sacks to a point near the center of the building where they are discharged onto the marine shipping belt. This belt operates on 600 foot centers through a passageway to a dock alongside the channel. Here ocean going vessels load cement for other points in the United States and the Orient or barges are loaded for shipments to points on the Bay. A sack counter on this belt records the number of sacks being conveyed to the dock, and under ordinary conditions average 2,500 sacks into the ship per hour.

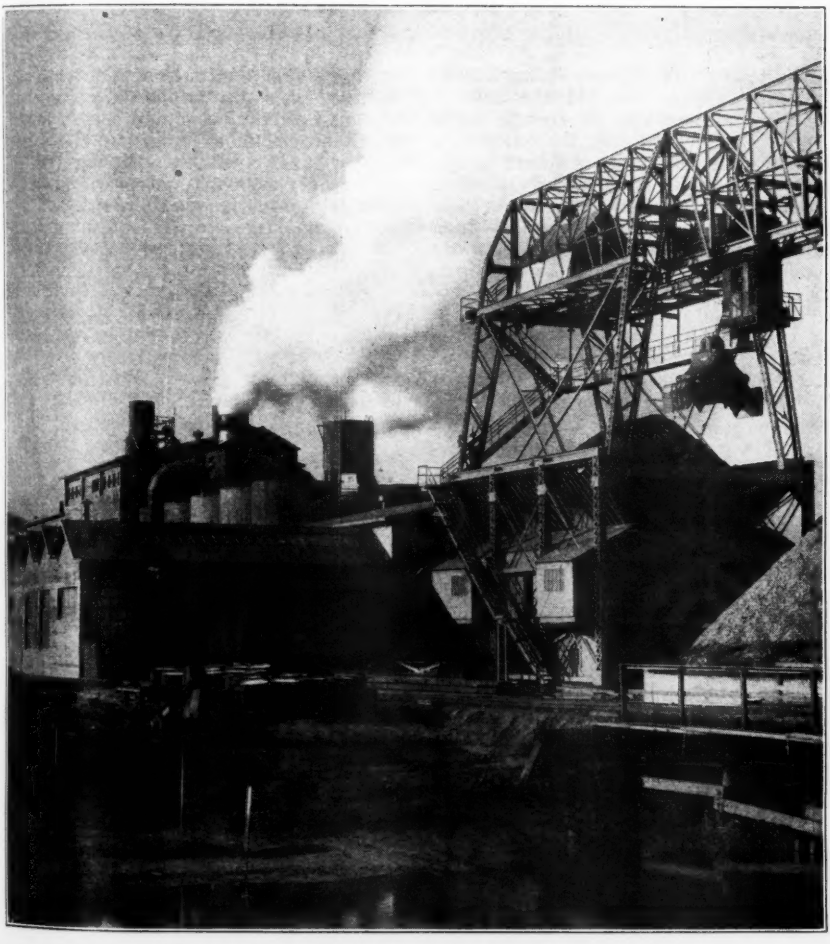
The Pacific Portland Cement Company Consolidated has adopted the Bates multi-wall bag for shipping its products. This bag affords protection against rough handling and moisture. It is made of five plys of tough pliable kraft paper. It is interesting to note that there is very little glue used in the making of this bag as the walls are sewed together at the top and bottom with a bound sewed seam which was designed to prevent the contents

Pumping Oyster Shells Into Barge

from sifting. After these walls have been sewed together, it really makes each wall a separate bag and acts as five bags in one. There is no expense incurred in cleaning, bailing, return freight charges or mending of old bags as the Bates multiwall bag is used once and sold as old paper. The outstanding feature of this bag is the multiplicity of walls. Should one or more of the walls be broken or snagged on a nail, leaving only one wall, it will still carry the contents without any loss and provides the dealer with a practical container for cement.

Shipments are made from this plant by motor truck, car, barge and steamship. It is the only plant in California so situated that it can barge cement to San Francisco, Oakland, Berkeley and other points on San Francsico Bay, load directly onto ocean going vessels, and ship by auto truck or railroad.

An efficient system takes care of the smoke and dust discharged from the kiln. The hot gases from each kiln are discharged through an American exhauster fan which draws the gases downward from the feed end of the kiln through a large dust chamber, through a horizontal passageway in which sprays of water wash part of the dust particles from the gases, up through another passageway to the exhauster fan. The exhaust from the fan leads to the roof where the discharge from the two kilns is led into a common horizontal passageway or flume which leads to four chambers



The Overhead Electric Crane and Storage Units

in the lower part of the Cottrell dust precipitator. A door in the top of the vertical passageway to the flume is provided to discharge the gases into the open air in case it is found necessary to pass the dust precipitator. From these chambers, which are constructed of wood, wire-wound 8-inch redwood pipes lead upward to 4 more wooden chambers leading to the open air. Charges of electricity at a pressure of 75,000 volts are passed through the center of the redwood pipes, precipitating all remaining particles of dust from the kiln discharge gases. To clean the pipes the electricity is shut off for a minute while water is sprayed into the pipes. Looking at the dust precipitator one sees a small cloud of steam ascending a few feet into the air and disappearing, which is the only sign of dust or smoke discharge from the entire plant.

The machine shop is equipped with all modern machinery required for quick repairs to any of the machinery used in the plant. A large overhead crane facilitates the work of this department. In the machine shop are three Sullivan air compressors 14x8¾ x10 furnishing air for plant use, for operation of the air lift pumps, and

Two Views of the Outside Storage and Reclaiming System

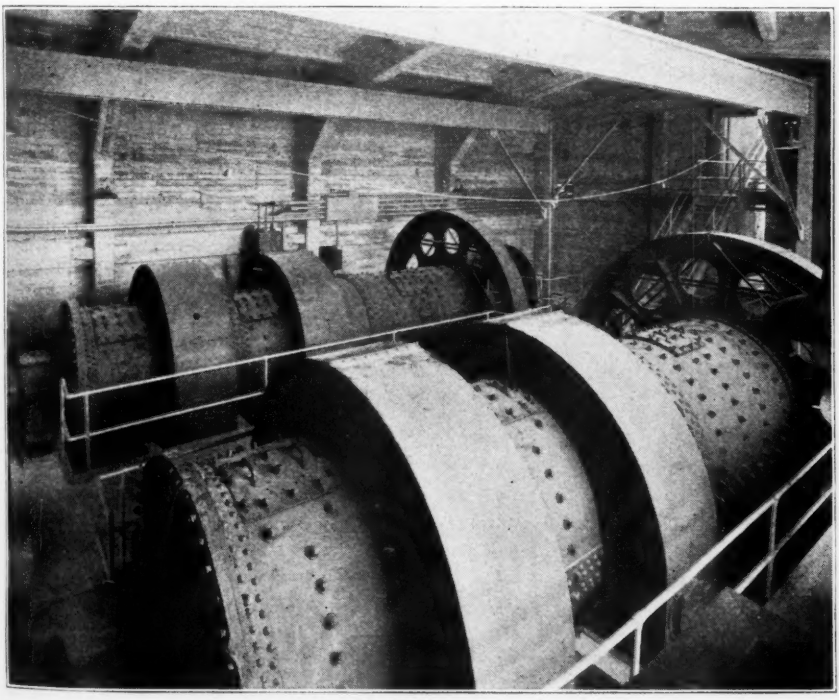
for air agitation of the slurry.

The storehouse is arranged so that all material has to be passed out by the man in charge who keeps a close account of all material issued. Material and supplies are issued on requisition signed by the proper authority. Provision has been made in the construction of this building for the installation of an overhead crane. The chemical laboratory is large and well equipped for making the standard tests required in the manufacture of cement. Washrooms, drinking fountains and garage space are provided for the employees.

The Pacific Portland Cement Company Consolidated has operated another cement plant at Cement, Solano County, California, since 1901. This same company is also one of the leading gypsum producers on the Pacific Coast. In May, 1924, they commenced operations at their gypsum mill at Gerlach, Nevada. A gypsum plant at Mound House, Nevada, had been operated for many years previous to the Gerlach plant. Early this year another gypsum plant was opened at Plaster City, California.

The gypsum deposit at Gerlach is a huge mound in the foothills at the base of a range of granite mountains. It is a remarkably pure and clean deposit. Gypsum in rock form is at the surface, and stripping is not necessary. A Marion number 32 electric revolving shovel loads 15 yard Koppel dump cars which are hauled by a 9 ton Plymouth gasoline locomotive to a rotary car dumper. This dumper is operated by compressed air and turns the car completely over which discharges to a 10 foot grizzly feeder. The rock is fed to a number 6 Williams Jumbo mill which reduces the rock to ¾ inch and less at the rate of 100 tons per hour. This mill discharges the crushed rock to a 24 inch inclined belt conveyor which delivers to a concrete bin of 300 tons capacity.

A Trenton Bleichert aerial tramway system built by the American Steel and Wire Company transports the material to the mill. The tram loading bin is provided with three air operated gates for loading the tram buckets. This aerial tramway is five miles long and has a total drop of 850 feet between the loading and the discharge points. The maximum span from tower to tower is over 2,000 feet. On

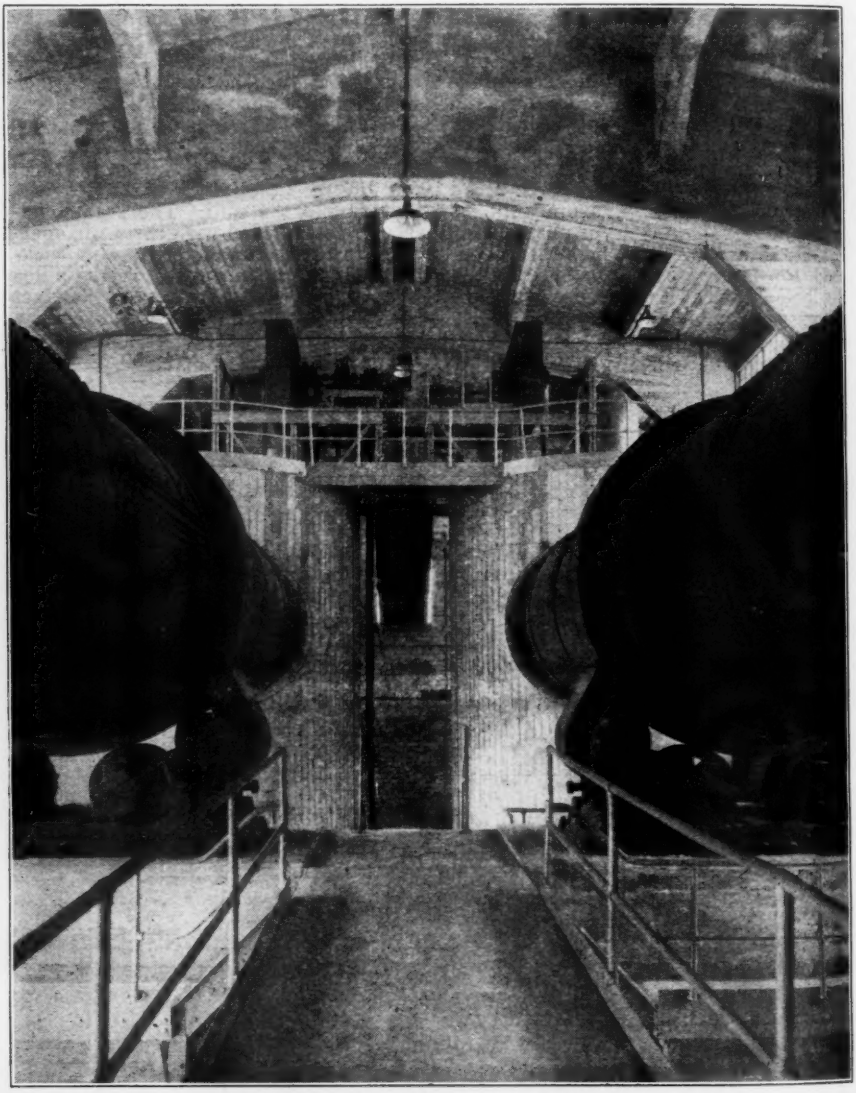


The Grinding Mills

an average 100 tons per hour is transported in this manner.

The tram buckets discharge to an open storage pile. From this storage the crushed rock is reclaimed by a tunnel belt conveyor which delivers to the mill storage. The quarry and tramway are operated nine months in the year and provide enough material to operate the gypsum mill twelve months.

The mill buildings are built of structural steel with galvanized corrugated steel. All floors are concrete. The raw grinding department consists of six Raymond mills. The calcining department consists of six 10 foot J. B. Ehrsam kettles. Fuel oil is used in the burning. The stock house consists of eight concrete silos each of 400 tons finished plaster capacity. A conveying system permits the discharge from the kettles to be delivered either to the stock house or to the packing house as desired. Three tube Bates valve bag packers are used.



Feed End of Kiln Showing Duct Chamber

The company generates its own power. The power plant consists of three 800 h.p. Price Bathburn oil engines each direct connected to a 675 K. V. A. General Electric generator. All motors throughout the plant are Westinghouse 3 phase 440 volt 60 cycle. The entire layout of this plant is efficient in the finest detail. All moving parts are entirely protected. Stairs, platforms, etc., are equipped with hand rails. Ladders are not permitted in the plant, and ample space surrounds each unit permitting ease and safety for inspection and repairs. The plant is located in a desert, and this necessitated building and operating a town for the employees.

The other gypsum plant, at Plaster City, California, which was put into operation early this year is especially interesting. The deposit is probably the largest and purest gypsum deposit being operated. The temperature conditions in this locality have proven to be a liability as far as the care of

Interior View in Kiln Room Showing Type of Structure

the employees and their production are concerned. The high temperature had to be considered in the plant structure, and the living conditions of the employees demanded special attention of the management.

An Armstrong well drill and Hercules powder are used in working the deposit in 36 foot benches. A Marion steam shovel and a Pawling and Harnischfeger gasoline shovel load the rock into 30 ton all steel Koppel cars of special design with triple bodies. After being loaded the cars are hauled over the main line of the San Diego and Arizona Railway, a distance of 27 miles, to the plant. This railway is narrow gauge.

The rock upon arriving at the plant is hoisted to a hopper which feeds a 32x44 inch Ehrsam jaw crusher. The discharge from this crusher passes to two Ehrsam pot crushers which reduce the rock to 1 inch and less. The dust from these crushers is collected by Raymond fans which discharge to agricultural gypsum bins. The discharge from the pot crushers passes to concrete bins. Material is drawn from these bins by a screw conveyor which delivers either to the Raymond mill bins or to cars to be shipped as crude gypsum.

There are five Raymond mills each driven by its individual motor. The material from these mills passes to a Raymond air separator from which the material passes to the land plaster bins. There are three 10 foot Ehrsam calcining kettles each of which produces 100 tons per hour. Oil is used as fuel.

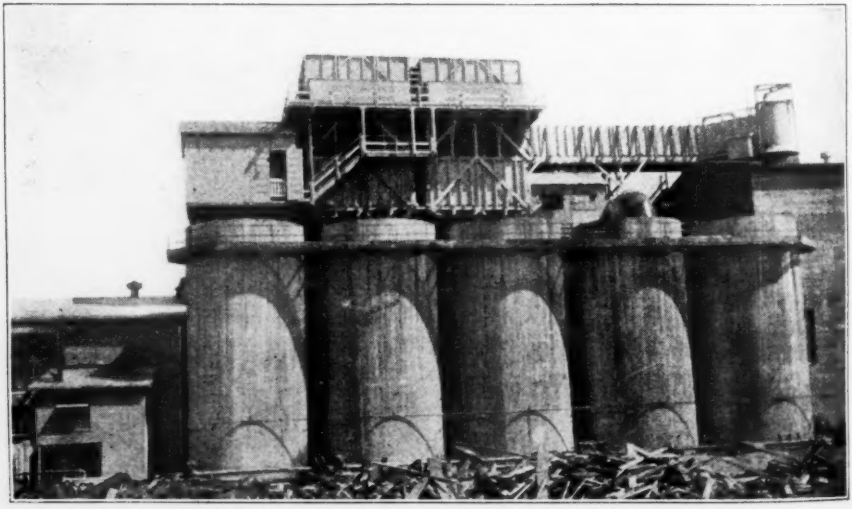
All of the men are housed and fed at the plant. The company operates its own ice plant to provide abundant quantities. It is necessary to provide entertainment and other diversions for the employees.

The products produced are agricultural gypsum, crude gypsum, hardwall and finish plaster, casting molding and dental plaster. The capacity of the plant is 360 tons per day.

This description of the Redwood City plant and the brief summary of the two gypsum operations should be sufficient evidence to support the assertion that the Pacific Portland Cement Company Consolidated is one of the most entertaining companies in the entire non-metallic mineral industry. The main offices of this company are in San Francisco. The officers include R. B. Henderson, President and General Manager; J. D. McKee, Vice President; H. T. Battele, Secretary; J. H. Colton, Vice President in charge of operations; J. H. Keeler, Vice President in charge of sales and traffic; R. F. Herrod, Purchasing Agent; and A. G. Lang, Chief Engineer.

Consolidation

The Weir Frog Company and the Kilby Frog and Switch Company have consolidated under the name, Weir Kilby Corporation. O. D. Vanderbilt, Jr. is President; E. M. Kilby and J. K. Lansdowne are Vice Presidents.



The Slurry Silos With Dust Precipitator on Top

Standardization of Explosives

By R. N. Van Winkle

PRODUCERS who have tried to make an intelligent study of explosives for the benefit of their particular operations or consumption find the many different grades, strengths, sizes and trade names applied or given to explosives very confusing and quite often misleading to the extent of often times being costly to themselves.

Competition in the sale of commercial explosives has been very keen as we all know, but not from a price basis. As far as the operator or consumer is concerned, the prices quoted on explosives and blasting accessories are practically uniform; that is to say, one gets about the same price regardless of which established manufacturer quotes you. Therefore, to promote sales, explosive manufacturers whether knowingly or not have injected confusing elements into their sales talks, not confusing to themselves, but misleading to the user who has not the time or disposition to analyze the question as the manufacturer has, but is to a great extent dependent upon sales advice and recommendations.

It is apparent that the manufacturers of explosives have come to realize this deficiency and are now attempting to standardize strengths of explosives and sizes of cartridges so that the manufacturer, salesman and consumer in referring to explosives will speak the same language. This will eliminate confusion and base competition squarely upon efficiency in production and distribution and upon intrinsic merit of production instead of upon confusing sales propaganda. Furthermore, it is claimed that this standardization will reduce selling cost, stabilize mass production, decrease litigation, etc., all of which should be reflected in a reduction of price to the consumer. If such were the case, the quarry and open pit mining industry would heartily welcome such standardization and co-operate to the fullest extent in revising their operations and requirements as fast as possible to conform to the use of standardized explosives.

In a pamphlet issued September 1st, 1925, by the Institute of Makers of Explosives, 103 Park Avenue, New York City, is given a clear and concise statement of the reasons for this standardization which reads as follows:

"The explosive industry, as represented by the Institute of Makers of Explosives, is intensely interested in the problem of standardization of strengths and sizes. The importance of this subject has been made familiar to the public through the publicity given it by the Department of Commerce and the Chamber of Commerce of the United States of America. The Department of Commerce has emphasized the importance which it attaches to the problem through the creation of a special branch known as the "Division of Simplified Practice." The advantages of standardization have been aptly summed up by the American Standardization Committee, American Section, International Chamber of Commerce, as follows:

1. It stabilizes production and employment, since it makes it safe for the manufacturer to accumulate stock during periods of slack orders, which he can not safely do with an unstandardized product.
2. It reduces selling cost. Possibilities of reduced costs are generally even greater in distribution than in production.
3. It promotes fairness in competition by enabling buyer and seller to speak the same language, and making it possible to compel competitive sellers to do likewise.
4. It lowers unit costs to the public by making mass production possible, as has been so strikingly shown in the case of incandescent lamps and automobiles.
5. It decreases industrial litigation.
6. It eliminates indecision both in production and utilization—a prolific cause of inefficiency and waste.
7. By concentrating on fewer lines it enables more thought and energy to be put into design, so that they will be more efficient and economical.
8. It acts as a powerful stimulus to developments and research, and at the same time is one of the principal means of getting the results into actual use in industry and business.

9. It helps to eliminate practices which are merely the result of accident or tradition and which impede development.
10. By concentration on essentials and the consequent suppression of confusing elements intended merely for sales effect, it helps to base competition squarely upon efficiency in production and distribution and upon intrinsic merit of product.

Realizing that standardization can be accomplished only through the cooperation of manufacturer, distributor and consumer, and that such standardization must be to the interest of all of these, the Institute of Makers of Explosives has not attempted to fix an arbitrary standardization of varieties. A special committee has, however, made a study based on the records of the companies comprising the Institute to determine the varieties most commonly used and has recommended the strengths and sizes which in its opinion will be sufficient to meet the needs of consumers of explosives. The Institute is, therefore, in position to furnish to the consuming trade a list of the sizes and strengths which it recommends as standards for the industry, together with an additional list showing other strengths and sizes which are apparently demanded by the consuming trade, but which could be eliminated if the consumers would substitute one of the strengths or sizes recommended. These lists follow.

The manufacturers of high explosives feel that it is a part of the service to which their customers are entitled, to furnish explosives in the strengths and sizes of cartridges which are best adapted to the particular work of the consumer. It is, however, apparent that if the variety of the strengths and sizes can be reduced to a minimum, the manufacturer can secure minimum costs and can afford to supply the trade at minimum prices, and can provide the best service in the matter of deliveries. The Institute, therefore, strongly recommends that the consumers of explosives, who heretofore have felt it advisable to specify the strengths or sizes shown on the additional lists, as above, carefully consider whether their requirements can be met by changing to one of the recommended standard sizes or strengths."

The standardization of explosives strengths and sizes is a great thing for the explosive industry and also for the consumer. If it can be worked out on a basis of equal value for the explosive manufacturer and for the consumer it is a splendid idea and is deserving of the support of every one.

Sizes Recommended as Standards

Nitroglycerin	Ammonia	Gelatin	Permissibles
1 x 8	1 x 8	1 x 8	.....
.....	1⅛ x 8	1⅛ x 8	1⅛ x 8
1¼ x 8	1¼ x 8	1¼ x 8	1¼ x 8
1½ x 8	1½ x 8	1½ x 8	1½ x 8
.....	.....	.....	1¾ x 6
4 x 8	4 x 8	4 x 8	.....
4 x16	4 x16	4 x16	.....
5 x16	5 x16	5 x16	.....
.....	.....	5 x24	.....
Bag	Bag		

Strengths Recommended as Standards

Nitroglycerin	Ammonia	Gelatin
5	..	..
10	..	..
15	..	..
20	20	..
..	..	25
..	30	30
..	33	..
..	..	35
40	40	40
50	50	50
60	60	60
..	..	80
..	..	100

Additional Sizes Apparently Now Required

Nitroglycerin	Ammonia	Gelatin	Permissibles
⅞ x 8	⅞ x 8	⅞ x 8	.....
.....	.....	.....	1 x 8
1⅛ x 8	.....	.....	.....
.....	1¼ x 7	1¼ x 7	1¼ x 7
.....	.....	.....	1½ x 7
1¾ x 8	1¾ x 8	1¾ x 8	.....
.....	2 x 4	2 x 4	.....
2 x 8	2 x 8	2 x 8	.....
3 x 8	3 x 8	3 x 8	.....
4 x10	4 x10	4 x10	.....
4 x12	4 x12	4 x12	.....
4½ x 8	4½ x 8	4½ x 8	.....
4½ x10	4½ x10	4½ x10	.....
4½ x12	4½ x12	4½ x12	.....
4½ x16	4½ x16	4½ x16	.....
5 x 8	5 x 8	5 x 8	.....
5 x10	5 x10	5 x10	.....
5 x12	5 x12	5 x12	.....

Additional Strengths Apparently Now Required

Nitroglycerin	Ammonia	Gelatin
..	15	..
17	17	..
25	25	..
27	..	..
30	..	..
35	35	..
..	..	75
..	..	90

The men in the stone and quarry industry are well acquainted with the problems of seasonal demand and the absurdity of making or producing a great variety of sizes of crushed stone to satisfy customers who place an occasional order. They are also familiar with waste in production and over development or duplication. While some of these questions have received attention looking toward solution in their own industry, there is

still room for improvement. The explosive industry is much older and better organized than the stone industry. For this reason they are better able and in better position to put up to the consumer and the public their problems in a concise and united way. The men in the quarry industry would be glad to have a similar opportunity with united support back of it. If the idea is new to you do not be against it because it is new.

Do not be disillusioned that this standardization is a new idea. It has a direct connection with the trend of the times; industrial consolidation, elimination of overhead and waste in production, curtailment of seasonal unemployment and the balancing of industry with the thousands of workers to cut down waste and tend to keep commodity prices down. Once we had the "trust busting era"; everyone was bent upon breaking up the great trusts and combines in which they could see no good and lots of evil. Now both talk and action is swinging in the other direction, and even such men as President Coolidge and Secretary of Labor Davis have openly added their weight and sanction to industrial consolidation. We are evidently approaching the triumph in matters of public regulation. We have seen that monopolies, if left to become absolute and all powerful, can do much harm. We are now coming to realize that production in certain lines, if broken up into too small units, is also harmful. We are coming to realize the economies of standardization and quantity or mass production.

As for the sizes and the strengths recommended as standards as set down above, it would appear that there should be a size intermediate between 1½ inch x 8 and 4 x 8 in nitroglycerin, ammonia and gelatin, say 3x6 or better yet 3 x 8; for there is a place for such a size cartridge in many quarry and open pit mining operations. If properly worked, a market for 1 x 4 low strength explosives could be developed for block hole loading in secondary shooting. This size cartridge unquestionably eliminates explosive waste in secondary blasting and gives a high cartridge count, if there is anything to high cartridge count. The elimination of cartridges smaller than 1 inch in diameter is a capital idea. A good rule to follow is to use the greatest diameter and the longest cartridge possible, for in that way you are getting the most for your money in the purchase of explosives.

This recommended standardization of sizes of cartridges and strengths of high explosives is nothing that is being thrust upon the consumer. It would stand to reason, as the pamphlet states, that with the facilities and records, to which the Institute of Makers of Explosives has access, the sizes recommended as standards and the strengths recommended as standards cover pretty thoroughly the requirements which the manufacturer is ordinarily called upon to fulfill for it covers the sizes and strengths most commonly used. Still another angle to the situation is the fact that all explosives manufacturers are not members of the Institute of Makers of Explosives. While these manufacturers may accept this standardization as sort of a vogue or basis, still the consumer need not worry, as he can doubtless obtain from some manufacturer the size and strength explosive he desires if standardized sizes and strengths are not to his liking.

There is only one more phase of this standardization of explosives that needs consideration. Explosives or blasting and drilling operations in the quarry and open pit mining industry are so interlocked and dependent upon each other for satisfactory results that before accepting the recommendations due consideration should be given the manufacturers of drills and drilling equipment and their recommendations. Possibly there is no reason for such a suggestion, but efficiency, economy and safety are the things to be desired in drilling and blasting; therefore drilling must be taken into account.

I have always found explosives manufacturers ready and willing not only to make a better product but to assist the purchaser in choosing and understanding the use of their products. When competition enters the field, they have sometimes been confusing in their sales propaganda to match or better their competitor's product, rarely in price, but in results and service. Results can be obtained if explosives of established makes are used properly. Service rendered is generally of the highest; so now if standardization will reduce the price to the consumer and quality and service will be maintained, let us have standardization by all means when properly worked out.

Distribution of Cement

The following figures show shipment from Portland cement mills distributed among the States to which cement was shipped during July and August, 1924 and 1925.

Portland cement shipped from mills into States, in July and August, 1924 and 1925, in barrels.*

Shipped to	January 1925	February 1925	March 1925	April 1925	May 1925	June 1925	July 1924	July 1925	August 1924	August 1925
Alabama	85,410	103,513	177,510	191,541	185,314	214,195	212,720	256,741	185,494	277,605
Alaska	132	0	294	709	0	1,284	1,432	2,816	1,053	264
Arizona	34,370	25,945	27,009	31,264	32,749	32,451	30,474	37,842	32,615	33,328
Arkansas	41,370	44,352	72,198	94,695	87,340	92,101	129,334	78,059	139,515	88,143
California	988,883	753,123	1,029,118	1,027,744	1,081,945	1,066,088	942,273	1,061,048	960,221	1,154,523
Colorado	42,425	69,871	102,537	131,363	125,744	120,818	161,005	118,272	174,924	118,335
	34,810	50,026	113,668	160,616	177,292	172,564	192,957	176,644	179,012	194,113
Connecticut	5,786	9,444	21,766	41,573	28,892	37,330	46,078	43,326	49,501	50,949
Delaware	37,285	65,176	58,474	70,765	103,996	81,334	79,851	82,133	80,080	83,155
District of Columbia	265,463	227,811	272,094	261,180	313,846	348,330	173,184	341,849	198,827	310,457
Florida	93,062	98,569	140,634	112,250	127,545	129,748	107,824	132,050	134,819	136,542
Georgia	417	0	1,500	2,250	5,608	6,108	5,451	993	1,842	1,108
Hawaii	2,598	11,029	17,667	28,393	28,613	28,122	23,922	28,498	28,042	31,846
Idaho	463,388	378,947	846,638	1,467,815	1,790,601	1,636,329	1,533,330	1,843,734	1,404,542	1,790,148
Illinois	139,782	143,464	255,597	433,996	569,436	617,360	744,692	658,042	781,376	690,624
Indiana	53,044	52,039	161,164	284,477	346,484	310,558	401,855	327,155	357,329	375,407
Iowa	33,588	120,405	212,402	232,220	242,880	233,522	199,437	226,787	228,297	254,074
Kansas	52,013	68,970	115,222	174,795	195,351	231,491	188,068	229,652	203,792	220,859
Kentucky	75,992	97,638	98,193	108,250	99,402	100,016	109,385	99,111	104,683	105,440
Louisiana	4,837	5,238	21,702	36,163	38,435	43,541	50,045	41,475	48,807	37,762
Maine	47,635	98,231	143,291	207,844	231,935	249,105	218,371	247,835	256,498	235,983
Maryland	113,101	134,591	257,381	344,406	374,243	350,620	388,173	386,058	369,062	357,825
Massachusetts	190,905	248,240	437,712	859,815	1,140,027	1,264,462	1,205,309	1,229,598	1,252,561	1,194,934
Michigan	59,395	97,034	173,618	321,854	425,473	409,235	405,863	436,453	392,542	472,018
Minnesota	29,867	28,564	35,778	48,174	47,573	66,012	41,506	67,446	60,512	70,141
Mississippi	115,141	162,992	379,157	489,316	652,330	583,561	427,101	683,097	435,736	723,916
Missouri	5,334	6,093	16,450	23,030	28,170	28,904	20,985	31,486	26,332	31,638
Montana	31,832	46,281	99,780	180,951	198,338	181,516	158,955	203,863	178,020	210,305
Nebraska	2,492	5,177	7,254	10,767	11,676	10,784	8,806	10,068	9,847	12,635
Nevada	9,419	15,911	27,592	39,906	36,814	40,837	41,240	41,843	46,592	52,941
New Hampshire	157,612	243,534	498,227	722,751	721,605	737,572	738,895	760,944	712,602	653,685
New Jersey	7,911	10,320	18,865	19,699	17,141	18,406	22,007	16,323	24,153	17,246
New Mexico	400,896	587,674	1,159,830	1,717,441	2,028,808	2,090,644	2,041,145	2,170,960	1,966,885	2,156,950
New York	79,817	128,770	200,097	277,616	289,056	324,201	259,730	343,683	383,174	340,027
North Carolina	1,380	3,742	16,589	38,937	47,789	66,089	72,154	55,305	33,148	37,735
North Dakota	259,628	271,075	592,069	894,683	1,054,230	1,099,767	1,211,851	1,099,016	1,164,939	1,212,138
Ohio	58,872	155,083	203,161	201,886	235,096	225,879	177,823	225,729	193,464	286,912
Oklahoma	54,117	60,816	103,813	101,661	129,048	134,038	140,656	143,672	153,691	157,360
Oregon	288,916	421,519	808,636	1,250,501	1,482,560	1,869,299	1,580,596	1,869,377	1,737,633	1,852,734
Pennsylvania	0	0	0	0	0	0	0	0	0	0
Porto Rico	15,688	17,908	54,083	79,063	72,914	89,213	60,649	75,383	63,326	71,900
Rhode Island	46,840	73,313	72,929	65,806	74,198	85,087	42,238	75,376	50,890	92,255
South Carolina	4,331	14,528	40,697	57,039	66,445	59,120	70,244	55,487	53,360	57,380
South Dakota	69,669	87,499	116,856	133,037	163,812	185,536	148,173	208,562	176,909	193,279
Tennessee	260,540	345,057	381,320	401,517	373,605	411,795	388,590	418,401	379,845	404,161
Texas	3,794	16,821	28,567	33,469	41,447	37,733	55,413	38,975	41,539	45,985
Utah	3,129	3,060	10,312	25,353	24,178	26,978	35,469	26,245	46,512	23,698
Vermont	54,445	95,942	132,891	160,139	154,167	172,760	156,644	180,025	189,686	176,842
Virginia	85,969	90,669	151,814	180,845	265,735	328,589	179,521	334,466	208,254	323,325
Washington	45,912	56,629	85,703	134,357	140,992	161,484	226,563	164,874	207,811	177,994
West Virginia	113,396	73,320	142,620	358,379	507,654	569,687	586,677	562,363	551,562	626,004
Wisconsin	3,492	9,181	16,358	19,981	32,466	31,290	47,769	25,691	46,597	31,042
Wyoming	15,964	26,430	46,236	34,875	8,023	3,996	66,488	48,647	73,614	3,056
Unspecified	5,092,090	5,961,563	10,205,073	14,327,067	16,659,016	17,417,489	16,558,921	18,033,478	16,782,067	18,258,726
Foreign countries	69,910	53,437	73,927	66,933	75,984	83,511	55,079	97,522	72,933	124,274
Total shipped from cement plants	5,162,000	6,015,000	10,279,000	14,394,000	16,735,000	17,501,000	16,614,000	18,131,000	16,855,000	18,383,000

a Includes estimated distribution of shipments from three plants in July and August, 1925;

A New and Efficient Gypsum Plant

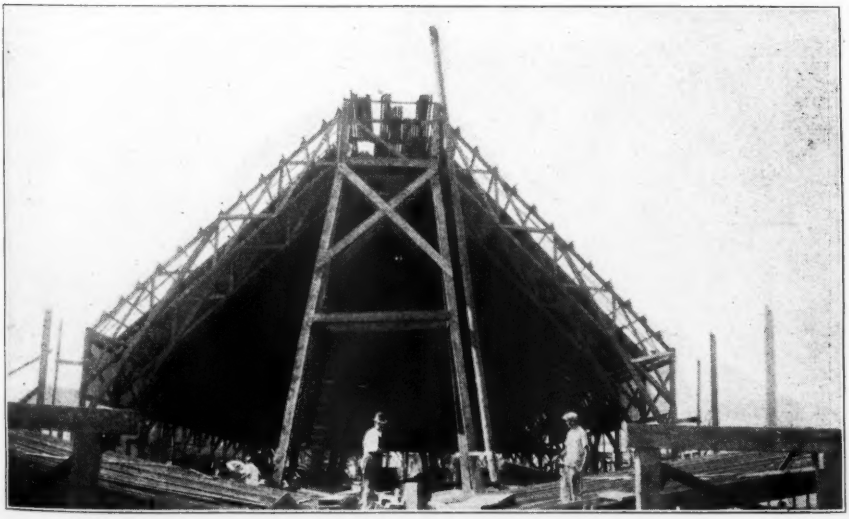
By E. D. Roberts

GYPSUM products will probably be in process of manufacture at the new plant of the Standard Gypsum Company at Long Beach, California, as this number of PIT AND QUARRY comes from the press. This new three kettle gypsum plaster plant has just been completed and will enable the Standard Gypsum Company to enter all Pacific Coast markets with their products. Entering the field with a two kettle plant at Ludwig, Nevada, they soon found it necessary to double its capacity, which was done some time ago. They have now added five more kettles to their capacity by the construction of a new efficient two kettle plant at Seattle, Washington, and a similar three kettle plant at Long Beach, California. Run of mine gypsum rock for the two new plants is brought from San Marcos Island in the Gulf of Lower California. A long time contract has been entered into with the Company Occidental Mexicana for their total output, which is transported to Seattle and Long Beach in ocean steamers under charter to the Standard Gypsum Company. It is hoped that the Standard Gypsum Company will soon be operating its own carriers in this service.

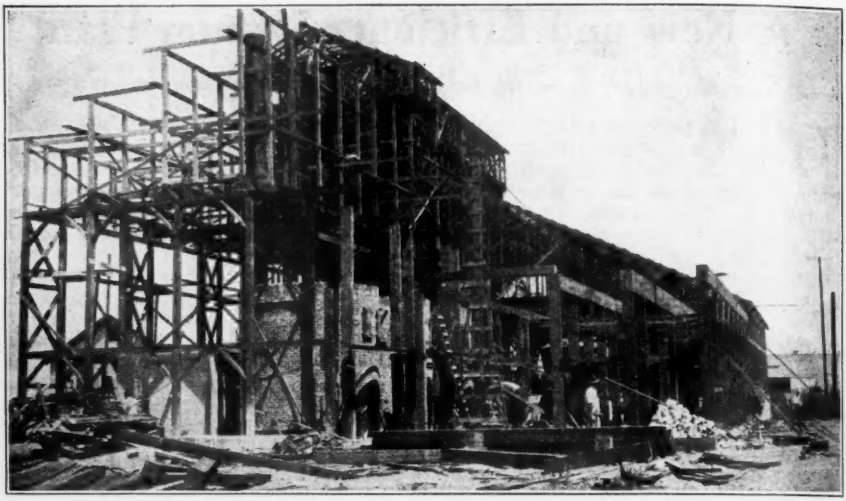
Long Beach is a steadily growing community of about 125,000 people. The city is favored with a good harbor which is being improved on a big scale. It is also one of the seaports for the city of Los Angeles. This last reason was the dominant one for the location of the plant at this point. The whole of Southern California is easily reached by auto truck and rail from Long Beach; and as they are in a position to ship by water to towns located upon the coast, the site can be considered an ideal one from a commercial standpoint.

The plant itself is one of, if not the most efficient plants in the world. Mr. Ridell of the Standard Gypsum Company designed it from a background of many years' experience in the manufacture of gypsum plaster in the design and operation of the plant at Ludwig, Nevada.

A dock 320 feet long and 43 feet wide was constructed along one of the slips in the inner harbor in the industrial section, which is the western part of Long Beach. Treated piles were driven by the Merril Chapman & Scott Construction Company for the dock supports. On these piles a timber deck supports a traveling A frame derrick which supports the clamshell used to unload the boats. This clamshell drops the gypsum

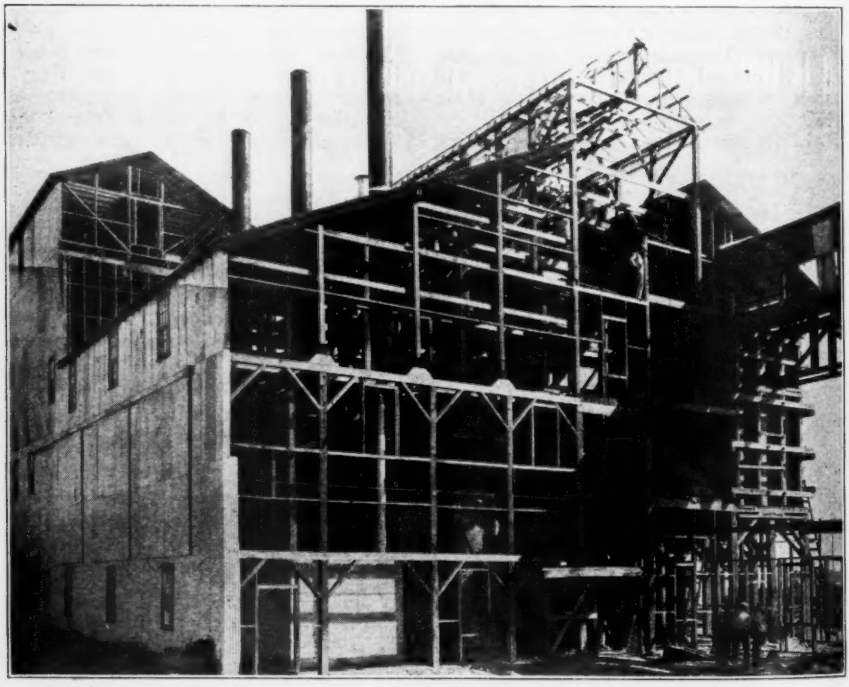


The Rock Storage Shed Looking from Dock



rock into a traveling hopper which discharges onto a 30 inch conveyor belt running along the face of the dock underneath the deck. This 30 inch belt discharges into a boot feeding an inclined bucket elevator which raises the rock to a point 40 feet above the stock pile and discharges it onto another 30 inch belt operating in a gallery 10 feet in width in the top of the structure covering the stock pile.

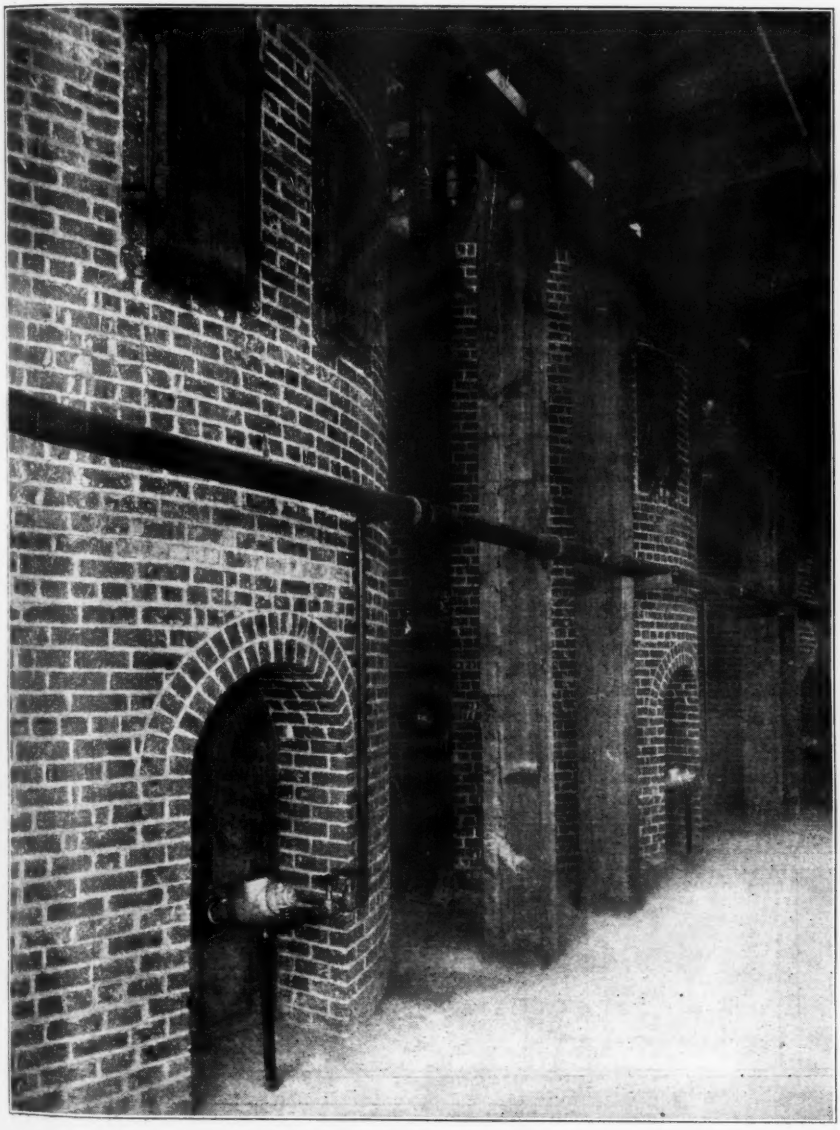
The stock pile is 270 feet long by 71 feet wide with a total capacity of 20,000 tons of rock. A 6x6 foot wooden tunnel on a concrete floor has



Two Views of Mill Building Taken During Construction

been constructed under this pile. Ehrsam pan feeders placed in the top of this tunnel at 10 foot intervals feed the rock onto an 18 inch belt which operates in the tunnel. The stock pile arrangement is such that 11,000 tons of the 20,000 tons stored can be drawn off by gravity, providing that amount of live storage. The stock pile has been covered so that the raw rock can be kept dry. Coming from a very dry climate, the gypsum rock does not need drying before grinding if it can be kept from contact with water.

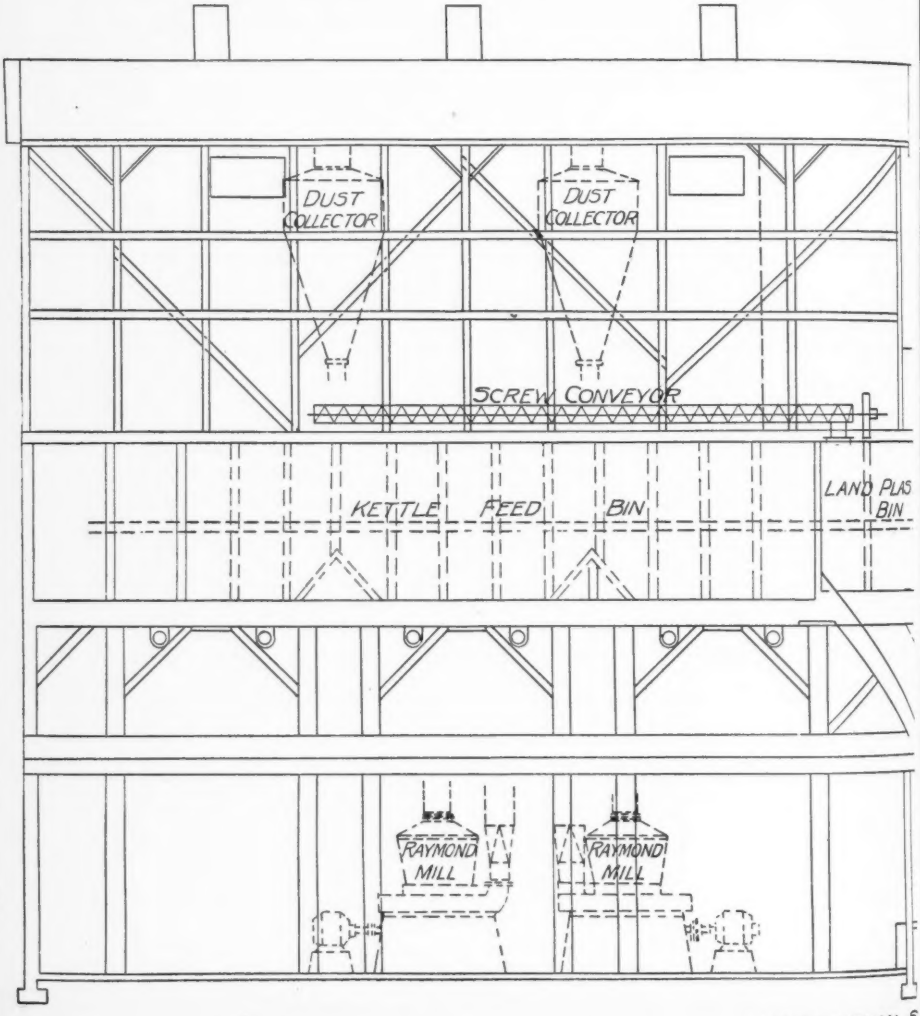
The 18 inch reclamation belt carries the rock from the tunnel and discharges into an Ehrsam rotating crusher which has been constructed in a concrete pit at the end of the stock pile building. The crusher reduces the rock to ¾ inch maximum



Front View of Calcining Kettles

and discharges it onto an 18 inch inclined belt which raises the gypsum to the top of the pebble bin into which it is discharged by means of a traveling tripper which distributes the rock throughout the length of the bin. Five hundred tons of raw gypsum rock can be stored here.

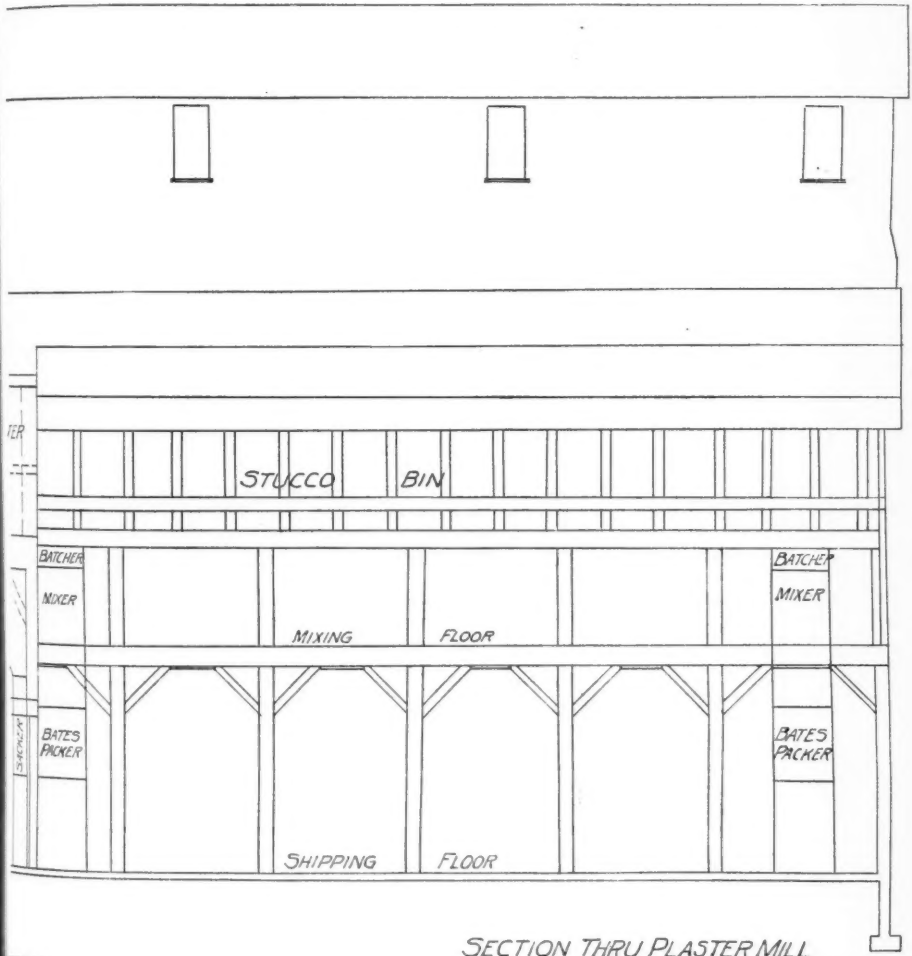
The pebble bin is constructed at an elevation such that the material will flow to the feeders of the Raymond mills. There are two 5 roller Raymond mills which reduce the gypsum rock to the proper fineness. All fans operated by direct connected General Electric motors draw off the pulverized or powdered material and discharge it into an air separator located in the top of the mill building. The coarse particles are returned to the mill for further grinding, while the fines are discharged into a conveyor operating along the top of the kettle bins. This conveyor distributes the material throughout the length of the bin, and when it is desired to use the ground gypsum for fertilizer, the conveyor carries it on past the kettle bin and discharges it into the land plaster bin.



LONGITUDINAL S

Six screw conveyors placed underneath the kettle bin, two conveyors to each of the three kettles, draw off the powdered gypsum and discharge it into the kettles. These kettles are known as the Ehrsam Kettle and have a capacity of 10 tons per batch. Natural gas from the Long Beach city mains is used as fuel to calcine the gypsum to plaster of paris. During the calcination the gypsum is kept constantly agitated by mechanical agitators operated by individual motors for each kettle.

When about three quarters of the water in the gypsum has been driven off, changing the chemical structure from $CaSo_3—2H_2O$ to $CaSo_3—\frac{1}{2}H_2O$, the material, which is now plaster of paris, is drawn off into hot pits so located that the product falls by gravity from the kettle into the hot pit. These hot pits hold several batches, giving ample time for the calcined gypsum to cool. Each batch is deposited on top of the previous one in the hot pit and when cooled sufficiently is drawn off by means of 6



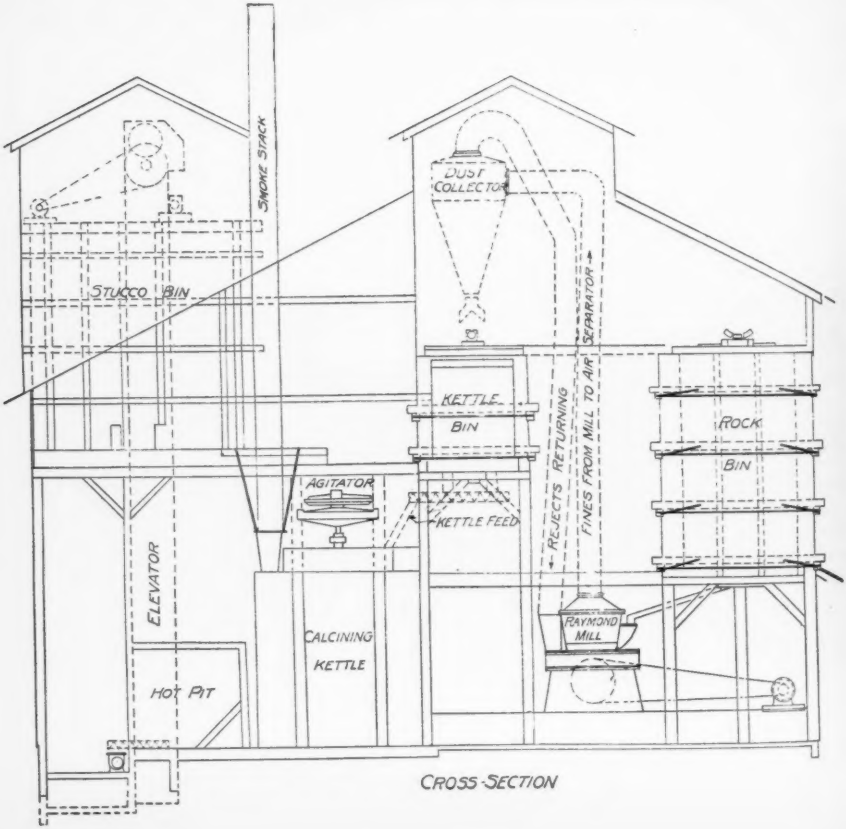
SECTION THRU PLASTER MILL
STANDARD GYPSUM CO.
LONG BEACH CAL.
TRACED FROM DRAWINGS BY H.WINNR ARCH.&ENGR
BY E.D.ROBERTS ASSOC.MEM.AM.SOC.C.E.

inch screw conveyors operating in the bottom of the hot pit. The bottoms of the hot pits are hoppered three ways to the conveyors so that they may be emptied by them. These 6 inch screw conveyors discharge into a cross screw conveyor which discharges into the boot of a steel encased elevator. This elevator raises the stucco to the top of the mixing building in 8x12 inch buckets where the material is discharged into a screw conveyor operating over the full length of the stucco bin. This conveyor distributes the stucco throughout the length of the bin which is 60 feet long by 20 feet wide and 20 feet high holding in excess of 1,000 tons of stucco.

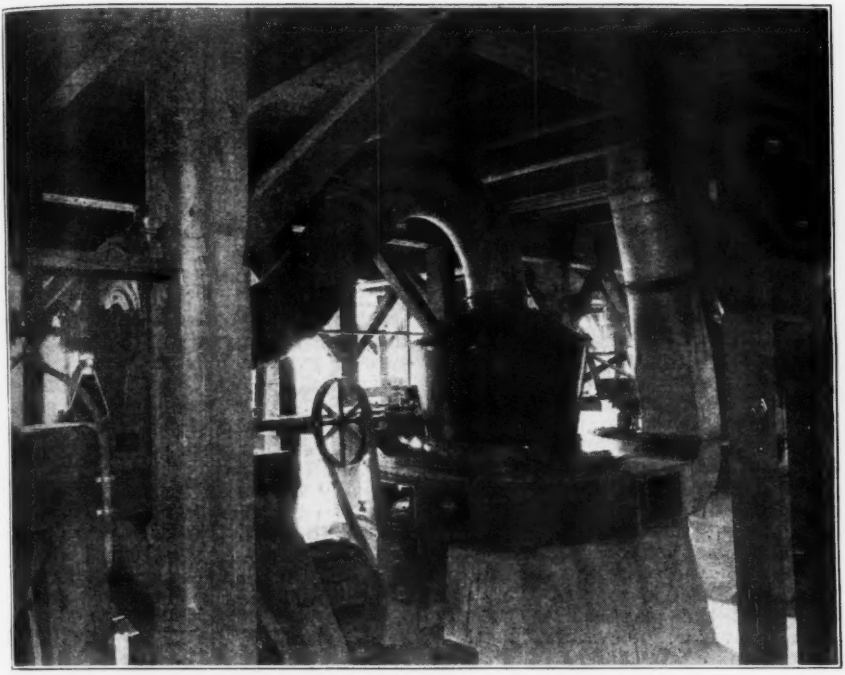
Two screw conveyors have been placed longitudinally under the stucco bin; one is a right hand and the other a left hand screw. By this arrangement the material is carried to the ends of the bin where it is discharged into a one ton batcher which measures the charges for the Ehrsam mixers. There are two of these batchers, one at each end of the stucco bin, and each one discharges directly into an Ehrsam mixer where the stucco is mixed thoroughly with the proper amount of retarder. The retarder is stored on the mixing floor for convenience in mixing and is added at the time of mixing.

The mixed plaster from each machine is discharged by gravity into a bin over a multivalve Bates packer. This Bates packer is so located that the filled sacks from the machine slide down an incline to a platform at the right height for the trucker to handle the sack conveniently onto his truck. The filled sacks are trucked directly into the cars or to trucks for shipment. The spill is chuted to a small bucket elevator which raises the plaster and discharges it into the mixer.

On the shipping floor is also located



CROSS-SECTION



Top View Shows Air Separator While Bottom View Shows Gear Agitator on the Kettles

the multivalve Bates packer for sacking the land plaster. The land plaster bin is so located that it discharges by gravity to the packing machine located in the shipping room. A gate operated by a ratchet provides for drawing off the land plaster directly in case of bulk shipments.

The plaster mill building presents a very pleasing appearance due to the design of the interior of the building and the excellent workmanship exercised in the construction. The structure is of the wooden mill building type. All members are surfaced four sides with joints neatly fitted. The bins are built into the building which adds to its stability. The sides, tops and bottoms of all bins are constructed with two layers of 2 inch boards between which has been placed a layer of tar paper. This tar paper serves two purposes; keeping out moisture and keeping in the dust. All floors are of this same construction with the exception of the first floor which is of concrete.

General Electric motors are used throughout the plant. The crusher, screw conveyors, elevators, kettles, plaster mixing machines and pan feeders under the stock pile are all of Ehrsam manufacture. The conveyor rolls and trippers were furnished by the Bodinson Manufacturing Company of San Francisco. Raymond pulverizing mills are used for the fine grinding.

The office is located in a small building fronting on Water Street across the shipping track from the mill building. A well equipped laboratory is located in one end of this building. Here hourly samples of the stucco are tested to determine setting time and quality. Samples of sands from the various pits are tested to determine the amount of retarder required to give the proper set to the plaster to be used in the various localities. Samples of the raw rock are also tested to determine its purity and water content. A set of 100 samples tested 97 per cent calcium sulphate, the lowest sample being 95 per cent pure.

With good raw materials, an efficient mill operated by skilled workmen, and a great potential market, the Standard Gypsum Company has embarked upon a venture which promises great success. Mr. W. C. Ridell, who has also designed two other plaster plants for the Standard Gypsum Company, laid out this plant in the offices of H. Winner and Company, Architects and Engineers of San Francisco. Structural details and plans were prepared by H. Winner and Company.

Mr. Martin Uldall of San Francisco is President of the company and Mr. W. B. Gray, also of San Francisco, is Secretary. Mr. W. C. Ridell is Chief Engineer; Mr. W. B. Lenhart is Superintendent in charge of operation of this plant. Mr. Lenhart was formerly mill superintendent of the Standard Gypsum Company's plaster mill at Ludwig, Nevada, having spent many years in the manufacture of gypsum plaster. Mr. R. Wetzel of Oakland was Superintendent in charge of construction of the plant for the Standard Gypsum Company. All construction work with the one exception of the new dock was done by company forces under Mr. Wetzel's supervision. The Long Beach office of the Standard Gypsum Company is in the Citizens National Bank Building and the San Francisco office is located at 55 New Montgomery Street.

E. C. A. Booklet

The Equipment Corporation of America, manufacturers and rebuilders of pit and quarry machinery, have prepared for distribution an attractive booklet entitled " It Pays to Rent."

This company has four modern rebuilding plants equipped with the necessary facilities to properly rebuild machinery. Every piece of equipment that enters their plant is torn down to the frame and every part carefully inspected for defects or wear.

New bulletins 118 and 118-A describing the Apex Co. Recorder and Indicator are now ready for distribution by the Uehling Instrument Co., of Paterson, N. J. These instruments operate on the orifice principle and do not employ chemical solutions. The principle of operation is fully explained in the bulletins.

Mr. P. J. Riccobene has recently joined the home office sales organization of the Uehling Instrument Co., 473 Getty Ave., Paterson, N. J. Mr. Riccobene is a graduate of New York University in the Department of Mechanical Engineering and is a Junior Member of the A. S. M. E.

Asbestos Mining in Vermont

By George Ransom

ASBESTOS is mined by the Eden Asbestos Company, of Eden, Vermont, from an open quarry on the side of Belvedere Mountain at an elevation of 2,500 feet where the company owns something like 600 acres of property. It is claimed that the best grade of fibre is obtained, and judging from personal observation this seems to be the case.

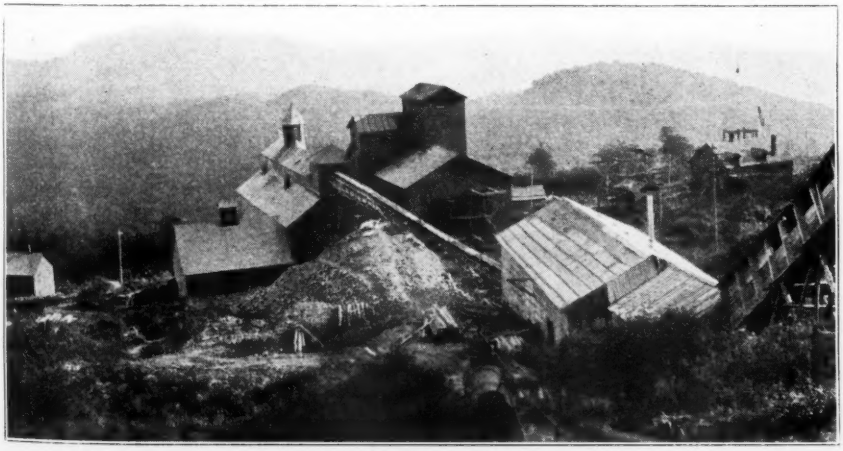
The quarry is located fifteen miles from the nearest railroad but is reached by a very good automobile road part of which is owned by the company. The situation on the mountainside and the remoteness from the railroad might, at first thought, seem to be a distinct disadvantage from the standpoint of economical production. However, this is largely compensated for by the fact that the railroad haul to the industrial centres of consumption is so much shorter than from the other high class asbestos operations in Canada that it is said to entirely offset this.

In spite of the remoteness of this particular enterprise and its comparatively little known existence it is now a very well equipped plant. The first attempt to start operations here was made a good many years ago, but it has not been until recently that they have been seriously undertaking operation on a commercial scale. Every reasonable means has been taken to introduce labor saving machinery which, of course, is a very necessary feature in competing with the old established concerns in Canada. One of the most striking features of the whole operation is that it is located on a steep mountainside, as will be seen from the picture. This greatly facilitates the progress of material by gravity from one process to another.

The asbestos is taken out by blasting as a result of drilling either with an old fashioned Ingersoll-Sargent tripod drill, which is especially convenient in some locations or by an Ingersoll-Rand jack hammer.

The quarry is on the side of the mountain and therefore is not in the form of a pit; consequently it does not require pumping. Tracks lead from the lower level of the quarry to a conveyor to the primary crusher. The cars traveling over the crushers are loaded by means of a Marion steam shovel, which, of course, is a very great labor saver. This shovel travels over sections of heavy planking which are easily moved about.

The rock is dumped into a conveyor which carries it to a 15x30 Ferrel-Beacon crusher driven by a 75 H.P., 440 volt General Electric induction motor. The material drops from this to a belt conveyor which carries it to a direct heat rotary dryer. From the dryer it is carried by means of a large covered belt conveyor to the top of the mill. As it is at times unnecessary to dry the crushed stone,



General View of Eden Asbestos Plant

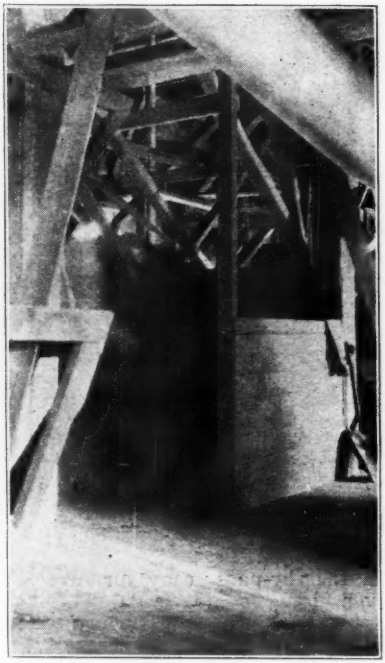
Fiberizer and Shaking Screen

Asbestos Quarry on Side of Belvedere Mountain

a belt conveyor has been provided which acts as a by-pass around the dryer. Thus such material as does not need drying is simply dropped off the belt conveyor bringing it from the primary crusher onto the belt short circuiting the dryer, and is dropped from the latter onto the long belt conveyor which carries it to the top of the mill. This little, seemingly insignificant, arrangement is really of considerable importance because the heater has to be operated with coal; and coal, delivered in northern Vermont, is high priced under the best of circumstances, and especially so

View Showing Mill and Housing for Carrying Waste Materials to Dump

Point Where Rock Is Dumped to Crusher

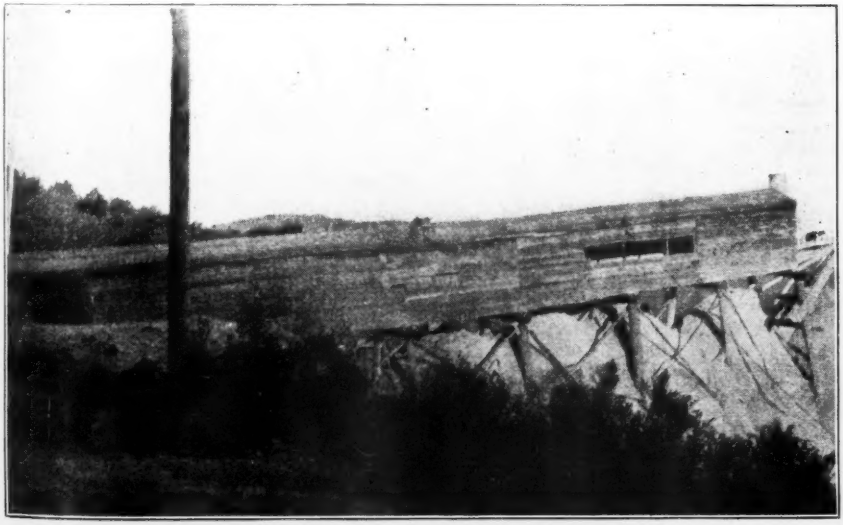


One of the Bins for Graded Asbestos Fibre

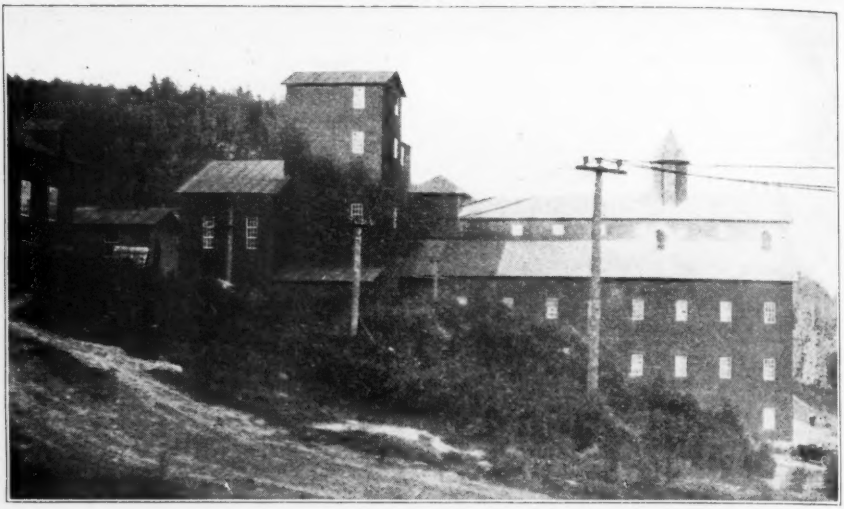
when it must be transported 15 miles by motor truck more than half way up the side of a mountain.

As shown in the picture the mill is a tall building, at least on the side away from the slope of the mountain, having several floors. This is because it is economical to perform each successive milling operation on a floor below the preceding one in order that gravity may be used in so far as practicable in transporting the material from one machine to the next.

The belt conveyor from the crusher to the dryer, the rotary dryer itself,



Detail of Housing for Waste Material Distribution



Side View of Part of Mill

and the by-pass conveyor are all driven by one 75 H.P., 440 volt Crocker-Wheeler induction motor. The long belt conveyor which carries the crushed material to the top of the mill is operated by its own 15 H.P. motor. At the top of the mill all material is deposited in bins by the long belt conveyor. It is drawn off by gravity from the bottom of these bins and drops on to a grizzly.

The fine materials which pass through the grizzly drop into a fiberizer, a machine especially designed by Mr. Wm. Jrimard, the superintendent, which he intends to patent. This strips the asbestos fibres from the small pieces of rock and drops both onto a shaking screen which separates the asbestos fibres from the rock. The fibres, of all lengths, as well as small pieces of stone which pass through the screen are then picked up by an air current and sub-

Steam Shovel Used for Loading Asbestos Rock to Dump Cars

jected to an air separating process which deposits practically pure asbestos in the grading machines. These are simply hexagonal rotating screens with different sized mesh which separates fibres of various lengths. From these graders the asbestos is deposited in appropriate bins according to length of fibre. The next and final operation is that of bagging.

The coarse material, which does not pass through the grizzly under the bins containing crushed rock from the primary crusher, slides off into a second Ferrel-Beacon crusher and then to a fiberizer and succession of operations already described. Waste material from the air separating process is carried by means of a belt conveyor to the dump on the side of the mountain.

It will thus be seen that, from the time of drilling until that of bagging, every step in production is automatic. Labor is required only for the operation of the drills, the operation of the steam shovel, dumping the cars into the primary crusher, firing the dryer and a minimum amount of attendance along the line of progress, and bagging. Even the motor trucks are loaded by means of a chute.

The graded product deposited in the various bins is tested at intervals by a small grading machine consisting of a series of standard mesh screens which revolve at 600 R.P.M. One pound of a given grade is placed in the proper screen which is then started and allowed to run for two minutes. If more than a certain predetermined percentage of asbestos passes through this, the grading has been improperly done.

The fact that coal must be used in the dryer and the steam shovel is not such a disadvantage from the trucking standpoint because trucks which take down a load of finished product to the railroad can easily bring back a load of coal at not very much greater expense than coming back empty. It is not by any means necessary that every return trip be made with coal, which is fortunate, for this is a convenient and efficient manner of bringing in supplies of all kinds.

Electrical drive and lighting are used throughout. Power is delivered at 33,000 volts and stepped down to 440 volts, 3 phase, 60 cycle. All motors are induction motors and the principal ones are of the following sizes:

5—75 H.P. for primary crusher,
Rotary dryer and belt conveyors.
Blowers.
Graders.
Secondary crushers.
1—50 H.P. for a blower.
1—20 H.P. for a compressor for drilling.
1—15 H.P. for a pump to supply steam shovel with water.
1—15 H.P. for a belt conveyor from dryer to mill.

On account of the dust it is necessary to blow out all motors every day.

Austin Book of Buildings

The new Austin Book of Buildings of the Austin Company is in reality a reference book of building data illustrating and describing modern trends in the design, construction and equipment of industrial and commercial buildings. This edition is the eighth and it is by far the largest and most helpful.

Some of the unusual features in the new edition are:

—Cost of building trend with a chart showing seven-year period
—Multistory—Single Story building trend chart
—Chart showing decentralization in manufacturing and distribution
—Table of Comparative Insurance Rates
—Chart showing how soil bearing pressure affects building costs
—A ten-page technical section covering descriptions, advantages, relative costs of various types of floors, doors, walls, roof structures, wall facings and roof waterproofings.

All of this special data is included in the new Austin Book in addition to a large number of illustrations and descriptions of modern industrial and commercial buildings. Multistory reinforced concrete and mill type buildings, as well as single story steel frame structures, are included—with examples selected from Austin operations extending from coast to coast. Austin Standard Buildings, Multistory and Single Story, are illustrated and described in the new book—an entire section being devoted to these well known structures of the permanent type.

Portland Cement Output in September, 1925

New September records were made in both production and shipments of Portland cement during the month just closed, according to statistics compiled by the Bureau of Mines, Department of Commerce. Production has been exceeded only by that of August; shipments by two other months only. During the nine months ending September 30 the shipments amounted to 124,311,000 barrels, which exceeded the record volume moved in the corresponding period of 1924 by over 10 per cent. Stocks of Portland cement decreased but are over 21 per cent greater than on September 30, 1924. The following tables, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are based mainly on the reports of producers of Portland cement. The September, 1925, totals include estimates for two plants.

Production, shipments, and stocks of finished Portland cement, by districts in September, 1924 and 1925, and stocks in August, 1925, in barrels.

(000 omitted.)

Commercial District:	Production. September 1924	Production. September 1925	Shipments. September 1924	Shipments. September 1925	Stocks at end of September 1924	Stocks at end of September 1925	Stocks at end of Aug. *1925
Eastern Pa., N. J. and Md.	3,528	3,685	4,247	4,428	1,373	1,041	1,784
New York	765	910	901	1,072	553	461	623
Ohio, Western, Pa. & W. Va.	1,628	1,620	1,752	1,905	895	1,232	1,517
Michigan	986	1,087	1,169	1,245	338	716	873
Wis.†, Ill., Ind. and Ky.	2,128	2,403	2,825	2,697	857	1,828	2,122
Va., Tenn., Ala. and Ga.	1,083	1,289	1,138	1,341	360	262	314
Eastern Mo., Ia., Minn., and S. Dak.‡	1,478	1,591	1,777	1,781	1,747	1,890	2,080
Western Mo., Neb., Kans. and Okla.	1,009	1,122	1,043	1,055	1,109	1,489	1,430
Texas	343	399	380	372	207	288	262
Colorado and Utah	262	215	269	211	184	366	362
California	1,015	1,223	1,011	1,199	338	414	391
Ore., Wash. and Mont.	294	395	315	405	443	184	194
	14,519	15,939	16,827	17,711	8,404	10,180	11,952

*Revised. †Began producing June, 1924. ‡Began producing December, 1924, and shipping January, 1925.

Stocks of clinker, or underground cement, at the mills at the end of September, 1925, amounted to about 4,572,000 barrels compared with 5,640,000 barrels (revised) at the beginning of the month.

Production, shipments, and stocks of finished Portland cement, by months, in 1924 and 1925, in barrels.

Month:	Production 1924	Production 1925	Shipments 1924	Shipments 1925	Stocks end of month 1924	Stocks end of month 1925
January	8,788,000	8,856,000	5,210,000	5,162,000	14,155,000	17,656,000
February	8,588,000	8,255,000	5,933,000	6,015,000	16,815,000	19,689,000
March	10,370,000	11,034,000	8,995,000	10,279,000	18,189,000	20,469,000
1st quarter	27,746,000	28,145,000	20,138,000	21,456,000	.....	.....
April	11,726,000	13,807,000	12,771,000	14,394,000	17,159,000	19,877,000
May	13,777,000	15,503,000	14,551,000	16,735,000	16,403,000	18,440,000
June	13,538,000	15,387,000	15,036,000	17,501,000	14,903,000	16,409,000
2nd quarter	39,041,000	44,697,000	42,358,000	48,630,000	.....	.....
July	14,029,000	15,641,000	16,614,000	18,131,000	12,319,000	13,896,000
August	15,128,000	16,419,000	16,855,000	18,383,000	10,666,000	*11,952,000
September	14,519,000	15,939,000	16,827,000	17,711,000	8,404,000	10,180,000
3rd quarter	43,676,000	47,999,000	50,296,000	54,225,000	.....	.....
October	14,820,000	.....	17,160,000	.....	6,073,000	.....
November	13,141,000	.....	10,289,000	.....	8,928,000	.....
December	10,435,000	.....	5,506,000	.....	13,913,000	.....
4th quarter	38,396,000	.....	32,955,000	.....	.....	.....
	148,859,000	.....	145,747,000	.....	.....	.....

*Revised.

Retarders for Portland Cement

By Ernest E. Berger*

Part I

ONE of the outstanding problems in the non-metallic industries, and one which involves two of the greatest of these industries, cement and gypsum, is the reaction of Portland cement with calcium sulphate. To all Portland cement clinker there is added, in manufacturing process, a small amount of retarder, as a necessary ingredient of the finished product. This retards the initial set, increases the strength, and adds to the plasticity of the cement so it will have the desired working and setting qualities. The retarder commonly used is gypsum ($CaSO_4.2H_2O$) which is the hydrous form of calcium sulphate. Calcium sulphate is also available as plaster of Paris ($CaSO_4.\frac{1}{2}HO$), and anhydrite ($CaSO_4$). The purpose of this inquiry was to determine the form or mixture of forms best adapted for retarder. The problem is complicated by the fact that cement clinker is a complex mixture of calcium silicates and aluminates, and that clinker from different mills, making cement of approximately equal quality, differs considerably in chemical constitution. Thus the same retarder may give very different results with different types of clinker, especially in the percentage of retarder required for the same degree of retardation.

It has been known for some time that a small percentage of plaster of paris will greatly retard the time of set of Portland cement as well as increase its strength and plasticity, but whether gypsum and anhydrite will have a similar effect is a much disputed question. The effects of gypsum have received a little consideration in laboratory research because, even though it will not retard a clinker when the two are mixed in the laboratory, as has been noted in some instances, the cement will have a normal set when the two are mixed in the large tube mill at the plant, so that practically, gypsum seems to be equally as good as plaster of paris, and because of the great saving in cost it has been used almost exclusively.

A wider field of utilization of anhydrite would be of considerable advantage to the gypsum industry. Some quarries are now troubled with quantities of anhydrite mixed with gypsum, a material which is difficult to market. Many other quarries which are now relatively free from this difficulty may, according to Newland have to meet it within the next generation. Committee C-11 on gypsum, of the American Society for Testing Materials, is convinced of the importance of obtaining some definite information on the utilization of anhydrite, and requested the Nonmetallic Minerals Station of the Bureau of Mines to undertake research work on anhydrite as a retarder in Portland cement.

Work of Other Investigators

Three cement companies, which had done some experimental work, freely supplied the information they had obtained. The reports submitted varied decidedly in results. Each company made tests using only the clinker from its own mills, and in consequence of the diversity of results none of them felt justified in drawing any definite conclusions except in so far as they applied to the particular clinker used.

A search of the literature has also failed to reveal enough definite information to enable one to form any opinion regarding the values of the different forms of calcium sulphate as retarders. This fact is very clearly brought out by Witt in a summary of the work which was done previous to his publication. A weakness noted by him was the recording of percentages of calcium sulphate used without reference to its form and without definite statement as to whether the percentage referred to the SO_3 content or to the amount of calcium sulphate as a whole. Eckel points out another weakness in previous work in that many of the reports include no information concerning the properties of the cement clinker, and consequently, the results cannot be intelligently applied. A third weakness commonly noted is failure to mention the method used in mixing the retarder with the clinker. The mixing process has an important bearing on the action of gypsum; therefore it is

*Assistant chemist, Bureau of Mines, Department of Commerce.

not safe to use the results for comparative purposes.

In making the above statements there is no intention of minimizing the importance of work already done. Every test made is a step in progress, but it is necessary to emphasize the need that existed of broader and more comprehensive study before results could be obtained that might have any general application.

METHOD OF TESTING

Preparation of Cement and Retarder Samples

It has been noted in investigations by plant chemists that the results obtained depended in a large measure upon the properties of the cement clinker that was being tested. Therefore, in order to obtain a general idea of the action of the different retarders on any cement clinker as well as a possible relation between this reaction and the individual characteristics of each, it was necessary to obtain a large number of samples representing many different localities. Consequently, twenty samples were obtained from separate mills representing twelve different states.

The samples were ground in a laboratory mill with steel balls to a slightly greater fineness than that specified by the American Society for Testing Materials, as it was thought that by so doing percentage of "flour" in the samples would more nearly approach that obtained by grinding in a large tube mill. As soon as the grinding was completed each sample was mixed thoroughly and a small representative portion removed for chemical analysis and for a determination of fineness. The remainder of the ground clinker was then stored in air-tight containers where it remained until tested.

All the forms of retarder were the purest commercial grade products available. The plaster of paris contained no other retarder. These samples were passed through a 200-mesh sieve, thoroughly mixed, analyzed and then placed in air-tight jars where they were kept ready for use. They were not mixed with the cement clinker until the night before the samples were to be tested.

General Nature of Tests

Tests were run with different percentages each of plaster of paris, gypsum, and anhydrite in order to determine which of the forms was the most efficient retarder. Their value could have been determined in some degree by simply noting their effect upon the time of set of the clinker but their effect on ultimate strength was of too great importance to be disregarded. To include this factor in the results, as many tensile strength tests were run as the size of the samples would permit. Furthermore, since anhydrite often occurs mixed with gypsum in nature, it seemed desirable to run tests with mixtures of the sulphates as well as with pure materials.

Method of Proportioning and Mixing the Retarder

It is no small problem to mix a small percentage of retarder with the cement clinker and obtain an absolutely uniform mixture. However, the method adopted appeared to be quite efficient, for a sample taken at random from any portion of the mix was nearly always within 0.05 per cent of the desired percentage. Occasional greater variations are due to errors in the sulphate analyses of the constituents and not to lack of uniformity in the mixtures. Where three sulphate-bearing compounds are thus mixed, accuracy in analysis is requisite if the SO_3 content of the mixture is to be maintained within the experimental error given above. If the variation exceeded 0.05 per cent the test was repeated in every case where the mixture was of any special importance. All percentages of retarder given in this paper refer to the percentage of SO_3 in the cement. Some of the curves refer to the percentage of SO_3 "added," but this is done to distinguish between the SO_3 of the retarder and that which was originally present in the clinker itself. Hereafter whenever the word "clinker" is used it refers to the material after it has been ground sufficiently to pass the A. S. T. M. specifications for fineness of Portland cement. After the retarder is added, the material is termed "cement."

The clinker and retarder were weighed out separately and then placed in a 10-mesh screen. The mixture was run through this screen ten or twelve times and then placed in a small pebble mill and stirred for about twenty minutes. This produced a more intimate mixture of the materials than could have been obtained by the sieve mixing alone, and as the mill was only large enough to hold a one-kilogram sample there was no possibility of enough heat being

generated to have any dehydrating action on the gypsum.

Determination of Time of Set

The specifications of the American Society for Testing Materials were followed in mixing the samples for time-of-set determinations. Both the Vicat and Gilmore needles were used, but, as there was usually a good check in results obtained, only one result is recorded in the table. This uniformity could not have been obtained if the end point with the Gilmore needle had been taken as the point where no "appreciable" indentation is noted, for this may have an altogether different meaning to each operator as well as variable meaning to the same operator from one day to the next. However, if the operator makes a few mental observations of the impression made by the small Gilmore needle when the Vicat shows the initial set, and then always takes this point as the initial set, he will find that as a rule it will check quite well with the time obtained by using the Vicat needle, (provided that both needles are allowed to rest on the "pat" of cement for a definite length of time before noting depth of penetrator). For determination of final set the time was taken when the large Gilmore needle made an impression of one millimeter in the pat of cement. This arbitrary point not only checked quite well with the final set obtained by the Vicat needle, but helped to make this point more definite. A similar modification was made by Mr. A. C. Tagge in the tests which he conducted for the Canada Cement Company, Ltd. at Montreal, and the results obtained proved to be quite satisfactory.

Determination of Tensile Strength

The specifications of the American Society for Testing Materials were followed throughout in making the tensile strength tests, except that neat cement was used instead of the 1:3 mortar. This was done not only in order to bring out more forcibly the difference which might be noted in the strength of the different samples, but also to point out slight variations which might not have been noticed if the effect had been minimized by the addition of three parts of sand. This was particularly necessary since the small amount of material available limited the tests to seven-day briquets. For this reason it might be worth while to make a more detailed study of this phase of the problem. However, the results obtained brought out the values of each retarder so consistently that definite conclusions are justified.

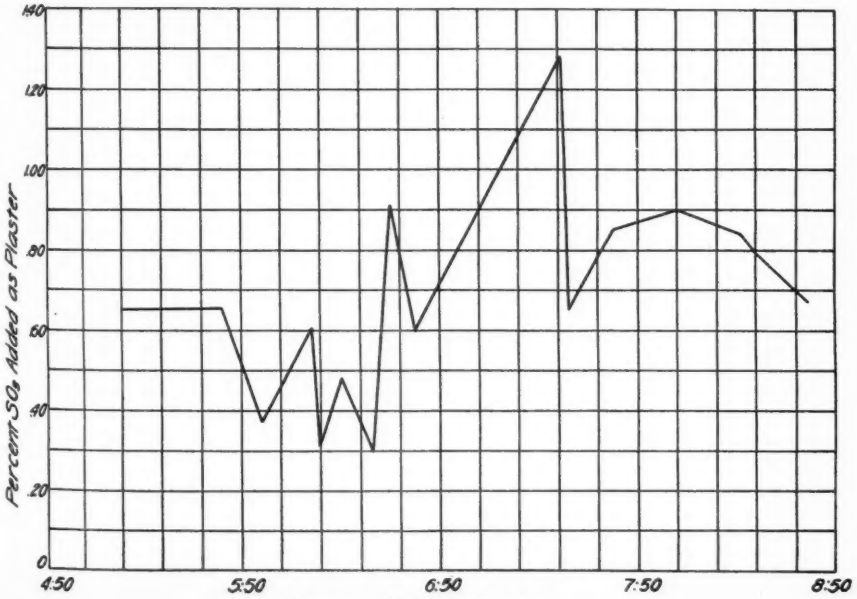


Fig. No. 1.—Relation Between Al_2O_3 Content of the Clinker and the Minimum % SO_3 as Plaster Required for Proper Retardation.

RESULTS OF EXPERIMENTAL WORK, AND DISCUSSION

Data on the results of the bureau's tests are presented in the chart, Figure 8.

Relation between Chemical Composition of Clinker and Reaction with Different Forms of Retarders

Different investigators have come to almost opposite conclusions regarding the value of anhydrite as a retarder in cement. Mead has concluded from his results that any one form of calcium sulphate is just as efficient for a retarder in cement clinker as any other, and Eckel has cited the work of Lewis which favors the use of anhydrous plaster. However, in the above instances, there is no statement regarding the method used in preparation of anhydrous plaster, so it is uncertain whether the results would have been the same if natural anhydrite had been used. One of the reports received from a plant chemist shows that in so far as time of set is concerned the use of anhydrite is permissible, but a larger amount of mixing water is necessary. At another plant it was found that anhydrite had practically no effect as a retarder.

All of the above investigations were conducted with different samples of clinker, so it was thought that the variation in the results might be connected in some way with the difference in composition of the clinker which was used. Consequently, a chemical analysis was made of all the samples used in the bureau tests with the hope of finding not only some relation between the composition of the clinker and the forms of retarder which could be used, but also some relation between this composition and the minimum percentage of each retarder which was necessary for the cement to assume a normal set.

The minimum amount of SO_3 as plaster of paris was studied in its relation to the composition of each clinker and also in relation to the different combinations of each constituent such as hydraulic index, lime ratio, cementation index, and activity index, but no definite relation could be determined betwen the composition of the clinker and the amount of SO_3 required for proper retardation.

Figure 1 is a good illustration of the erratic type of curves that were obtained. Von C. Schindler made a noteworthy attempt to find some relation between the Al_2O_3 content of the clinker and the limit of gypsum which could be used, but after a study of over twenty different samples of clinker he concluded that no such relation could be found. Witt has also made a study of the results which he obtained with different samples of

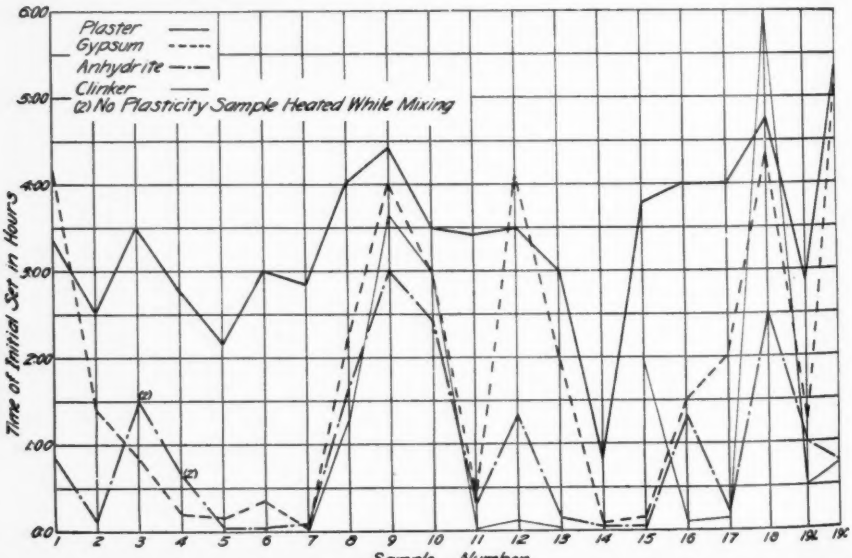


Fig. No. 3b. Maximum Retardation Produced by Different Forms of Calcium Sulphate Within the Maximum SO_3 Content of 2% and its Relation to the Time of Set of the Clinker itself.

Portland cement clinker, and concludes that the effect of calcium sulphate can not be determined in any way by the composition of the clinker, to which it is added.

In the bureau tests an attempt was

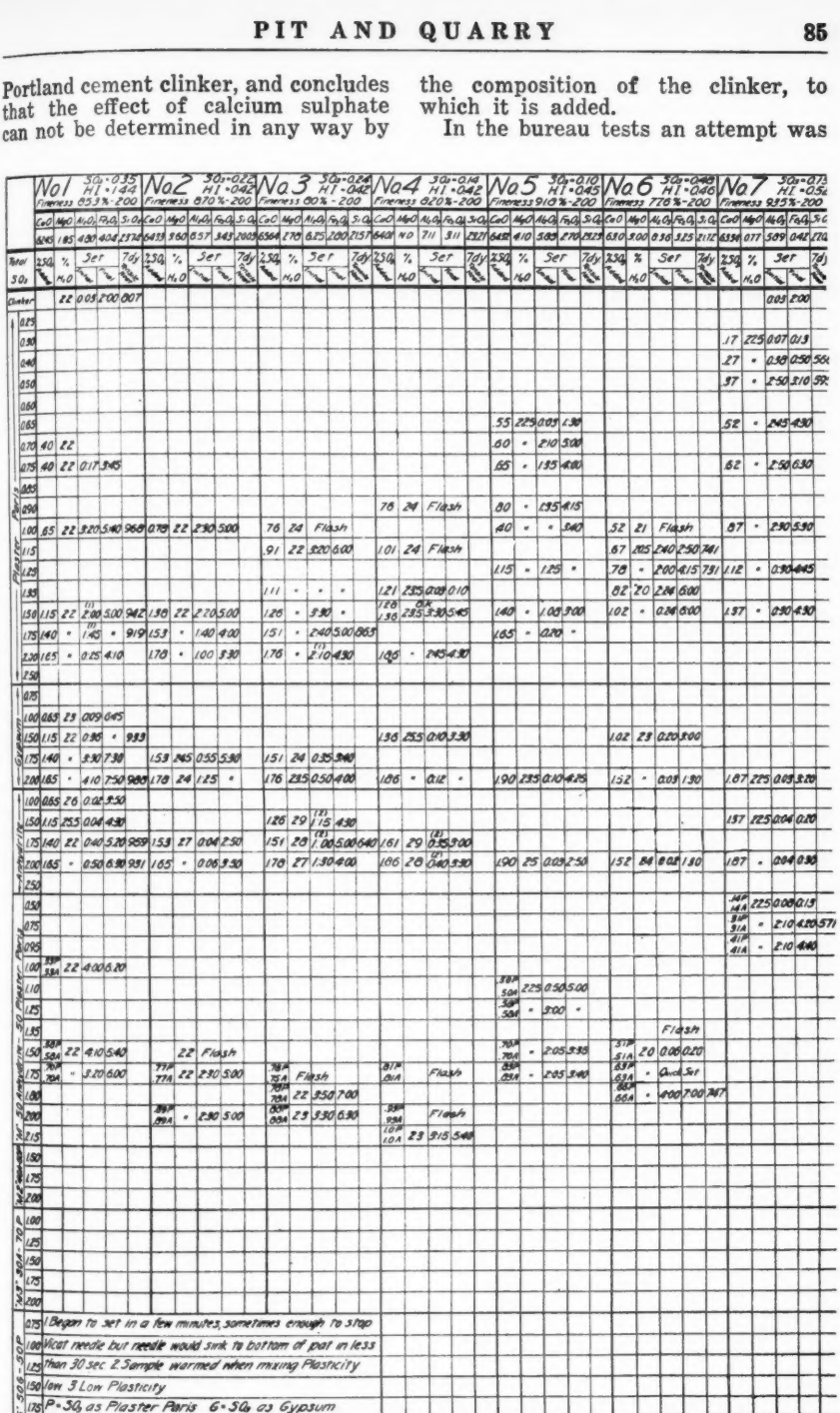


Figure 8

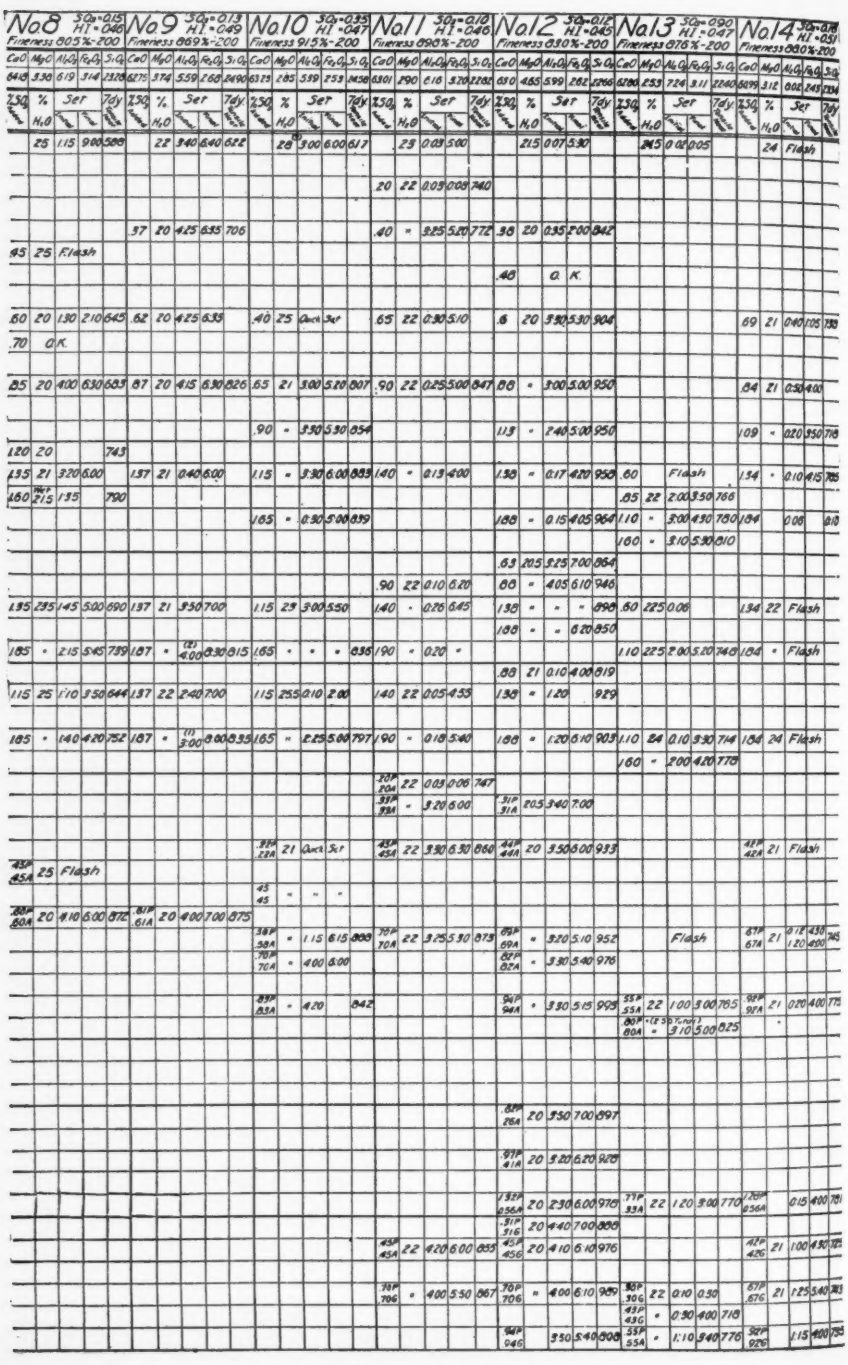


Figure 8 (Continued)

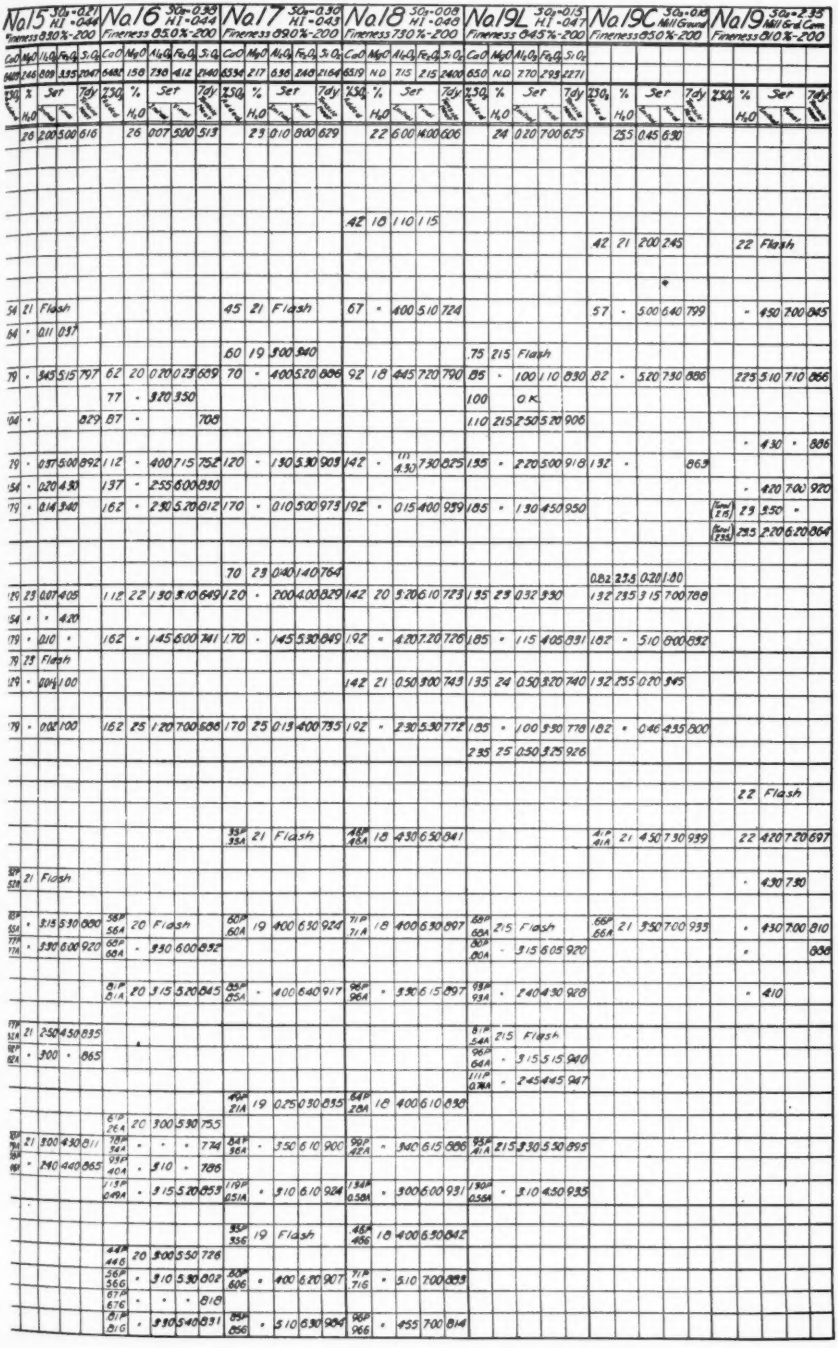


Figure 8 (Continued)

also made to find some relation between the chemical composition of the clinker and its reaction with gypsum, but it was found that this reaction does not depend upon any of the properties of the clinker that had been determined. It is true that the gypsum failed with all the samples having an Al_2O_3 content above 8 per cent (Nos. 6, 14 and 15) but it also failed with samples (Nos. 5 and 7) where the Al_2O_3 content is below 6 per cent. Similar difficulties were encountered when comparing the action of the gypsum with any other property of the clinker.

When anhydrite was employed as retarder, it may be noted from the table (Figure 8) and Figure 3b, that as long as the total maximum SO_3 content is kept at 2 per cent, anhydrite can be used with safety only when samples of clinker are of themselves slow setting. Even in this case the action of the clinker can not be predetermined by chemical analysis.

Therefore, as long as the composition of the clinker is kept within the limits necessary to produce satisfactory Portland cement, the slight variation in this composition will not account for the individual characteristics of each clinker. If the chemical analysis of each clinker were accompanied by data giving the condition of the raw mix when fed into the kiln, and also the time and temperature of burning, it might be possible to draw more definite conclusions concerning the factors that govern the properties of each clinker.

This fact emphasizes the great necessity for an investigation on the relation between the constitution of the Portland cement clinker and its physical and chemical properties. Of the twenty samples studied the maximum tensile strength at seven days varies from 785 to 988 pounds per square inch. Why does this marked variation occur? If it is due to the state of equilibrium of the three component systems, as suggested by Rankin, then it will only be necessary to follow his suggestion further, namely, to determine how close an approach to equilibrium (perfect burning) is desirable or economically possible.

There is another important possibility in connection with the utilization of anhydrite. With sample Number 1, a quick-setting clinker, with mixtures that were retarded with anhydrite were as strong as those retarded with any other form of calcium sulphate. With a slow-setting clinker like Number 18, the mixtures with anhydrite had a normal set, but the low plasticity, which anhydrite does little to modify, required a large amount of mixing water, resulting in low strength. The question arises, would it be possible after a detailed study of the constitution of these two samples to produce a clinker which, when mixed with anhydrite will produce a cement equal in quality to one which is retarded with any other form of calcium sulphate? At first thought, it seems unlikely that this could be done, since the $3CaO.Al_2O_3$ in the clinker that causes the quick set is also the compound that adds to the plasticity of the clinker. However, this compound must be present to some extent in both clinkers, and it is possible that a correct proportioning of the raw mix along with a careful control of the burning process might produce the type of clinker desired. It is interesting to note that the reactions of sample No. 12 approach these conditions quite closely, therefore, there is some justification for assuming that such an attainment is not impossible.

A few grams of nearly every sample of the ground clinker used in this investigation have been preserved in glass stoppered bottles. A quantitative study of the constitution of these samples would no doubt afford data of considerable value when studied in connection with the properties of each sample of clinker that have already been determined.

It would probably be necessary to undertake this problem through a petrographic study of each clinker. The crystalline properties of each constituent of Portland cement have been well established, and Bates has made a quantitative determination of the constitution of some samples of clinker. However, the close similarity in the structure of $3CaO.SiO_2$ and $3CaO.Al_2O_3$ made it necessary to determine these two constituents together, consequently further research is required before a complete analysis will be available. The importance of this problem has encouraged further investigation, and the Portland cement Association is at the present time making an intensive study of the constitution of Portland cement. The results of this study will be anticipated with much interest.

Burning Lime With a Gas Producer

By F. A. Westbrook

LOCATED in the town of Swanton, Vermont, the Swanton Lime Works operate a thoroughly modernized plant where several interesting devices for increasing efficiency have been successfully installed. The plant is owned and managed by Mr. John Rich of St. Albans, Vermont.

The outstanding feature is, of course, the installation of a Bradley Gas Producer, made by the Duffs Patents Corporation. This consists of a five kiln unit and has been in service since 1914. That this has been a success is attested by the fact that both Mr. Rich and Mr. O'Neil, his superintendent of a great many years standing, state that they would not consider going back to direct coal firing.

Among the operating advantages of using gas are the better control of the burning zone in the kiln, the cleanliness due to confining the firing to one point, greater freedom from exposure of men to excessive heat for the same reason, and saving in labor of attendance. The heat in any one kiln is, of course, controlled merely by opening and closing valves, which is a great convenience. With this equipment it has also been possible to make very economical arrangements for handling coal as will be explained later in detail.

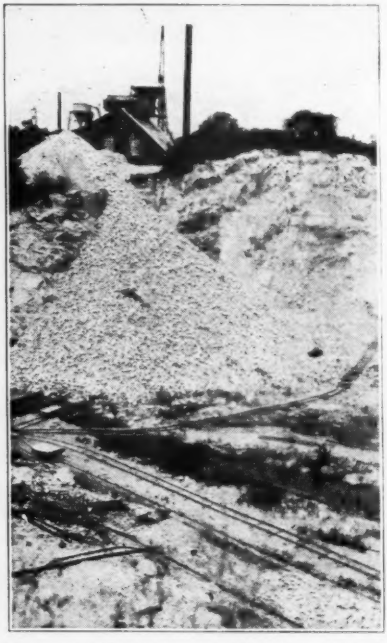
Formerly wood was used in the old kilns for burning lime, and at the time the plant was modernized, the controlling reason for installing the gas producer was that gas burning closely approximates the wood burning in its effect on the good quality of the lime. Now, as already stated, it has been found that gas has many advantages over direct coal firing in addition to that of quality.

The success of operating the producer depends entirely on the management of the producer itself,—the burning of the gas in the kilns is simple enough,—and this in turn depends on the man in charge. Mr. O'Neil has reduced the procedure to a few practical items.

In the first place ashes must be removed with regularity and before accumulations occur. This naturally means that attention must be given to this detail at more frequent intervals when all the kilns are being run than when only a part of them are in operation, which is obvious enough, but evidently is sometimes overlooked in some instances with unfortunate results. Variations in the grade of coal also cause variations in the amount of ash and must be watched.

The principal thing to watch, according to Mr. O'Neil, is to prevent the producer from becoming overheated. This occurs when the bell becomes red hot and indicates that

View of Old Quarry With Tracks Passing Through Tunnel to New Operations



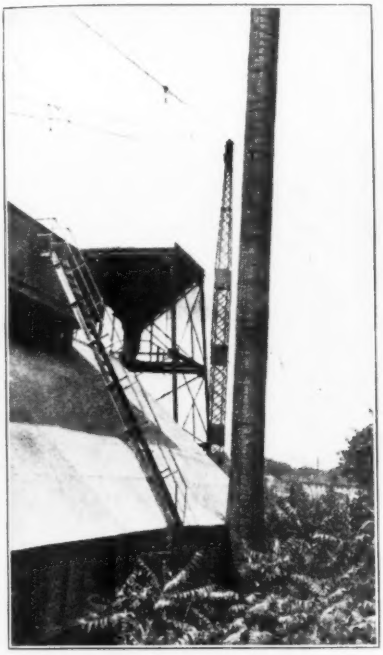
View of Plant Across Quarry Showing Cableway

Carriage with Dumping Controlled from Hoist House

the gas is burning in the producer. This is the greatest cause of trouble. It is easily obviated by keeping a clean, soft fire, thus preventing coking and the formation of air pockets which are excessively hot spots.

The next consideration relates to the steam pressure. The steam pressure controls the gas pressure. Hard stone, such as is obtained from the adjoining quarry in this operation, requires rather high pressure. If the kiln is smoking, it indicates that the pressure is too high and that unburned gas is escaping. If this is

Railroad Spur Alongside the Plant

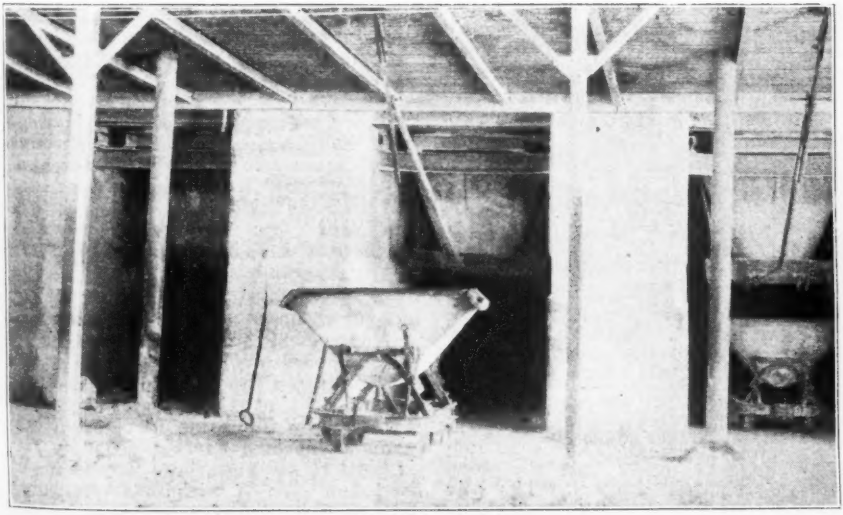


Steel Mast for Cableway

View of Kilns

the case, the first thing to do is to close down on the valves from the producer and next, if the smoking continues, to reduce the steam pressure. These are the main principles of management and, as Mr. O'Neil says, the actual technique of doing this comes only with experience. However, it is his opinion that any intelligent and mechanically inclined person can learn it without difficulty.

It should also be stated that the steam for the producer is furnished by an Oswego boiler, made by the



Bottom of Kilns Where Lime Is Drawn Off Into Cars

Ames Iron Works, which is located on the main floor of the plant.

One illustration shows a view of the interior of the plant and two of the kilns. The control is from a mezzanine platform, and the burned lime is drawn off at the bottom very much as with Keystone kilns. Figure 2 shows this in more detail and also the Arthur Koppel side dump cars used for taking the lime out on to the floor.

Most of the lime is at present being sold for the manufacture of chloride of lime and is being shipped in bulk. It is loaded into wheel barrows by hand and dumped into box cars stationed on a railroad spur close to that side of the building opposite the kilns.

Mention has been made that very efficient means for handling coal have been possible through the use of the producer. Figure 4 shows one end of the plant with a coal hopper above the building. It also shows a structural steel mast for the support of one end of a cableway extending above the hopper, and, in fact, over the tops of the kilns. The coal is simply dropped from the skips traveling on this cableway into the hopper. Coming from the bottom of the hopper will be seen a large pipe extending into the building which has its outlet on the mezzanine floor directly adjacent to, and on a level with the opening in the floor where the producer is fired. The flow of coal is controlled by a cut-off mechanism near the bottom of this pipe. The skip which carries the coal can be dumped from below so that it will be seen that it is not necessary to have a man at the top for this purpose.

The coal is brought in over a railroad spur and the cars are dumped from a low trestle at the end of the quarry. The coal slips down into the quarry at the point where the cars loaded with rock from the quarry are brought under the cableway for charging the kilns with stone. Thus all materials for burning lime are concentrated at one point under the cableway by means of which the producer and kilns are served.

The hoppers at the top of the kilns are filled with stone dropped from the cableway. This is accomplished without a man at the top. The coal hopper is slightly higher than the stone hoppers and behind them. The pile of refuse and the tracks at the bottom of the quarry, converging under the cableway, may also be seen in the distance.

From the foregoing it will be seen that one hoist and one cableway take care of lifting the stone from the quarry and serving both the kilns and the producer. The hoist is operated by a 35 H. P. induction motor. In the same building with this is an Ingersoll-Rand 10x10 Duplex air compressor driven by a 50 H. P. motor for drilling.

The Ruggles carrier was made by the Gray Foundry Company of Poultney, Vermont, and was especially designed for this operation by Mr. Griffiths, a slate quarry operator of Fair Haven, Vermont, and father of Mr. Richard Griffiths of the same place who is Vice President and General Manager of the Penryhn Slate Corporation.

The quarry itself covers considerable acreage. In fact there are several quarries. Lime has been made here for a great many years, and at first the stone was taken only from the surface where it was easiest to obtain. The good material has been pretty well taken out from the quarry and at least without undertaking expensive blasting, and it is now being obtained from the bottom of the older portions.

The tracks leading from the quarry pass through a tunnel to the present operations. This tunnel is the result of the sale in years gone by of excess land to a farmer and the granting of a right-of-way. The unfortunate thing was that right-of-way over the "existing road" was granted in the deed of sale which later on meant the making of the tunnel and expensive concrete retaining walls. If right-of-way over the company's property had been given without specifying the existing one it would have been possible to provide a perfectly satisfactory approach over a different route and much expense would have been saved.

It is evident that with the tracks leading through the bottom of the quarry directly to the point under the cableway where the stone is taken to the hoppers over the kilns without rehandling, a great saving is effected. The fact that the gas producer is supplied by the same hoist from the same point is a further economy. It is hard to see how these details could be taken care of with more economy. The only source of waste is from the incompletely burned pieces of stones.

Prime Movers in Stone Quarries and Sand and Gravel Pits

By C. H. Sonntag

Part I

This is the first part of a three part article on the above subject. The second and third parts will appear in the November 15th and December 1st numbers respectively.—Editor.

WHEN a stone quarry or sand and gravel pit operation is located in an isolated part of the country, or when electric energy can not be purchased at a reasonable price, it is necessary that the plant arrange to generate its own power. In doing this, there is a wide range of equipment to chose from, depending on whether the installation is to be temporary or permanent, on its size, on the availability of coal, oil or even natural gas at favorable delivered prices, and perhaps to some extent on the personal preference of the operator. As a guide to proper selection the various types of engines are briefly discussed in the following pages, with some remarks as to their application to different classes of work.

The basic classes into which modern prime movers fall are those of steam engines and internal combustion engines. Each of these has several subdivisions; the former according to valve mechanism and method of governing, the latter based on the kind of fuel, cycle of operation, number of cylinders, method of ignition, type of governor and other details.

The size of the power unit required by the average crushed stone plant or gravel pit is such that in many cases either the steam or internal combustion engine may be used. A wise choice resolves itself into a careful study of local conditions with a view to getting the most continuous and reliable operation at the least ultimate cost. That word, ultimate, should be carefully noted. It is not always true that the engine that costs least to buy and install is the one that gives least trouble from shut-downs, takes the least possible fuel, and is otherwise cheapest to run. In fact, the reverse is quite apt to be the case, and so all the factors that bear on the problem must be taken into consideration if a correct solution from the standpoint of ultimate expenditure is to be reached.

A very important point in determining the nature of the power plant to be used is the length of time the particular operation in question will be conducted. If the purchaser is building a permanent stone crushing plant, in which he is placing high-grade machinery with a view to effecting every possible economy in cost of production, it will usually be found that one of the better grades of prime mover is the proper one to buy, for the increased first cost will eventually be compensated for by the lesser fuel consumption and other upkeep expense.

In contrast to this there are many temporary set-ups such as sand and gravel pits where the supply of material or the market for it is limited. In this class are to be found small crushers or sand and gravel excavators and washers set up by road and other contractors, and intended to be used for one job only. Here the question is not so much one of economy in fuel as ruggedness and simplicity, so that the machinery may be kept running by comparatively unskilled labor.

Another matter deserving of careful consideration is that of the kind and cost of the available fuels. There will be operations where good coal may be had at almost mine-mouth prices. In such a case extreme fuel economy may be bought at too high a cost. Again, there are many undertakings in the West and Southwest where only poor coal is on the market and it is expensive, while oil is cheap and always obtainable. Here it is obvious that some form of heavy oil engine is apt to have the preference, and rightly so.

A power plant's sole reason for existence is the production of horsepower hours. What is done with these horsepower hours after they are generated is of no particular importance to the power plant. In developing power by burning fuel the cost of that fuel is not what the seller gets for it at his mine or refinery, but it must include the cost of delivery on the job and even in the furnace or engine cylinder. This delivery cost includes freight to the nearest unloading point, and hauling to the plant if

that is necessary. If transportation for a long distance over poor roads in a rough country is unavoidable, the fact should be borne in mind that a great deal more energy can be carried in the form of liquid fuel to be used in an internal combustion engine than in coal to be burned under a steam boiler. On the other hand, there may be cases where cord-wood may be had at the plant for the cost of cutting and hauling but a short distance. Manifestly the boiler and steam engine will then be the wise choice.

The universal ownership of automobiles has brought a number of peculiar developments in its train. One of these is the understanding of its motive power. Men who fifteen years ago could hardly keep a slide valve engine running can now do a pretty fair job of tinkering a gasoline engine, so that there need not be much fear of trouble with such power, even with unskilled labor in back-woods districts.

This article will not treat of steam boilers. The various classes of steam engines will be taken up first, together with some remarks on their applications, and internal combustion engines will be discussed later. But before leaving the general subject of power plant selection one more point must be emphasized. This is that there are many natural waters that are absolutely unfit to put into a steam boiler. Water pumped from wells in limestone districts is pretty certain to be very hard, and will form large quantities of scale in a boiler, lessening its efficiency, causing burned tubes and fire-sheets, and certainly necessitating frequent shut-downs for cleaning. In coal mining districts the water of the streams will quite likely contain free sulphuric acid or sulphates that will set free this acid on heating, and such waters are violently corrosive to the metal of a boiler. Waters of these classes can be made suitable for boiler feeding by proper treatment if one wants to go to the trouble and expense, but the alternative of the internal combustion engine should always be kept in mind.

STEAM ENGINES

The Slide Valve Engine

The oldest, simplest and best known of the steam engines in use today is the common slide valve type with throttling governor. It is the engine that was found on practically every farm tractor and road roller until the gasoline engine began to replace it. It is still manufactured for both purposes, especially in the larger sizes. Stationary slide valve units fifty years old may still be found running in out-of-the-way sawmills and similar places where fuel economy is not of importance.

Although it has been on the market for so many years this machine, like other engineering products, has undergone a certain amount of evolution. The older designs had open frames which permitted dirt and dust to have free access to the bearings, and allowed oil and water to be thrown around the engine and to run onto the floor. Such machines could not be made self-oiling, and depended on personal attention for their lubrication. While such engines are still made, the best designs have enclosed frames and embody well thought out automatic oiling features.

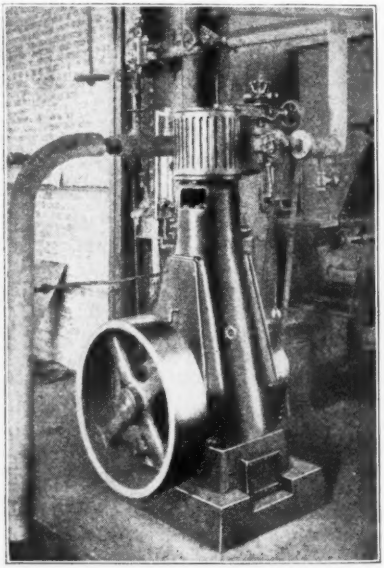


Figure 1—Vertical Throttling Self-Oiling Engine

The slide valve engine may be had in vertical or horizontal construction, and each has its proper application. The vertical design is used in the smaller sizes, and where floor space is at a premium. An engine of this kind is shown in Figure 1, in which the throttling governor driven by belt is plainly seen.

While it is a very simple device, it must be admitted that this governor, controlling the engine as it does by reducing the initial pressure of the

steam admitted to the cylinder is not an economical arrangement from the steam consumption standpoint. The steam expands to a larger volume during the throttling process, but does no work except upon itself. Theoretically this should result in some superheat, or at least the evaporation of the water carried by the steam, but in practice it is questionable whether this is of any value; and it may be said that, particularly at partial loads, the work done in expanding the steam from boiler to admission pressure is partly wasted. Another failure to take full advantage of the expensive property of steam under pressure is found in the fixed position of the eccentric, meaning that steam is admitted during the same portion of the stroke whatever the load. Hence large throttling engines, say up to 300 hp., are now seldom placed in new installations unless fuel economy is not a matter for serious consideration.

Nevertheless, there are many places where these engines in small sizes are the logical choice. They will tolerate more abuse than any other, and if made with enclosed frames and automatic oiling systems, like the one illustrated, will require little attention in that respect. Added features of this same machine are a partially balanced valve, to somewhat relieve the pressure of the steam on it and the force required to move it and sufficient freedom over the valve so that it can lift off its seat to pass excess cylinder condensation or slugs of water coming along with the steam. It will be apparent then that in matters of low cost, absolute reliability and little attention, those throttling engines in small sizes have a very definite place in industry.

Most of what has been said above will apply with equal force to the horizontal engine. For permanent installation the latter will require a larger and heavier foundation and will take up more room. Aside from general power generation its principal application around crushers and gravel pits is the operation of hoists and steam shovels. Here the construction is the simplest possible, and all refinements not absolutely necessary are eliminated. Even the cylinder lagging is frequently omitted. All that is wanted is absolute reliability. Engines in this service are always controlled by hand throttle, and steam economy is of secondary importance compared with delicacy of control. Reversal, if required, is by the simplest means, such as the Stephenson Link motion. Some of the steam shovel builders have developed a control by special valve in the valve chest of double cylinder engines whereby starting, stopping and reversing can be done with one handle.

The horizontal throttling engine is also found as the actuating element in the cheaper steam-driven air compressors. For this use the governor is fitted with an attachment whereby the steam supply is controlled by either the speed of the machine or the air pressure, whichever reaches its predetermined limit first.

The Automatic Engine

The distinguishing feature of this machine is that its speed is controlled by varying the stroke of its valve and sometimes its timing, which is done by changing the throw of its eccentric under the action of a governor contained in one of the fly-wheels. At partial loads, say between ¼ and ¾, this type of valve gear will give better steam economy than the throttling governor because steam is admitted to the cylinder under full boiler pressure, and so can go through the greatest possible expansion in the cylinder. At full load there is little difference, as steam must be admitted at boiler pressure in either case. At very light loads the automatic valve throttles the steam more than the regular throttling governor, and the automatic engine is the less economical of the two. In a well designed plant such a condition should not be habitual.

The automatic shaft governor is more sensitive than the throttling type, largely because it usually makes use of the inertia of its parts to secure prompt action. The automatic engine is also apt to be better built, as it is not likely to be bought quite so much on the basis of first cost. These things will make it, especially in the larger sizes, the more economical unit.

In small sizes it is made in the vertical style, like the throttling engine. Figure 2 shows such a machine direct connected to an alternating current generator and its exciter, and the compactness without sacrificing accessibility is evident. A direct current generator or belt transmission can be used just as well.

This cut of an automatic engine brings out two features that are also built into their machines by the makers of the better class of throttling

engines. One is the complete enclosure of the reciprocating parts, stopping all oil throwing and permitting the use of an automatic oiling system. The details will vary with different builders, but the result is a clean, inviting-looking engine. The other feature is the provision of two glands or stuffing boxes on the piston rod, which must in consequence be made somewhat longer than would otherwise be necessary. One of these is the familiar steam gland on the cylinder head, and the other is on a special partition in the crank case near the cylinder. The steam gland is apt to leak, and without the partition water from this

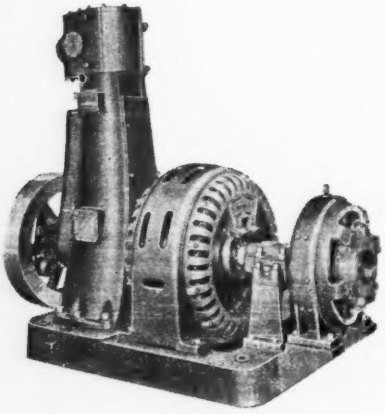


Figure 2—Alternating Current Generating Set

leakage is sure sooner or later to get into the crank case and mix with the oil. The other gland not only prevents water from following the rod, but also keeps oil from getting out of the crank-case via the same route. Any possible drip from either gland falls into a pocket between them from which it may be drained away.

1,556,764. Attrition mill. Allan P. Daniel, Springfield, Ohio, assignor to Bauer Bros. Co., same place.

1,556,797. Crusher. Benjamin A. Mitchell, Westerleigh, N. Y.

1,556,960. Excavating-machine. George T. Ronk, Leon, Iowa.

1,557,307. Crusher. Benjamin A. Mitchell, Westerleight, N. Y.

1,557 444. Pulverizing-machine. Ernst H. Elzemeyer, St. Louis, Mo., assignor to American Pulverizer Co., same place.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,553,328. Grinding-mill. Alexander J. Roubal, Milwaukee, Wis., assignor to Allis-Chalmers Mfg. Co., same place.

1,553,333. Crushing apparatus. Jacob M. Sholl and Ernest E. Pfeffer, Milwaukee, Wis., assignors to Allis-Chalmers Mfg. Co., same place.

1,553.393. Excavating apparatus. James S. Pates, Washington, Pa.

1,553,693. Screen for rock-crushers. Earl C. Jensen and Edward F. Dalton, Cedar Rapids, Iowa.

1,554,169. Gravel-screen. David B. Cook, Frankfort, N. Y., assignor to Acme Road Machinery Co., same place.

1,554,309. Pit-bucket latch. Charles C. Tippett, Luckey, Ohio.

1,554,376. Machine for picking up and collecting stones. Jacob Schrag, Rochester, N. Y.

1,554,723. Tunneling-machine. William E. Hamilton, Columbus, Ohio.

1,555,128. Screen. Van M. Lipscomb and Horace H. Hooper, Nashville, Tenn.

1,555,845. Car construction. David Hindahl, Chicago, Ill., assignor to Rodger Ballast Car Co., same place.

1,555 906. Drag-line excavator. Paul Burke, Green Bay, Wis., assignor to Northwest Engineering Co., same place.

1,555,907. Regenerative drag-line excavator. Paul Burke, Green Bay, Wis., assignor to Northwest Engineering Co., same place.

1,555,982. Mine-car. Warren V. Johnson, Bloomsburg, Pa., assignor to American Car & Foundry Co., New York, N. Y.

1,556 140. Steel mine-car. James B. Wolf, Glen Ridge, N. J., assignor to American Car & Foundry Co., New York, N. Y.

1,556,574. Excavating-machine Edwin J. Armstrong, Erie, Pa., assignor to Erie Steam Shovel Co., same place.

1,556,595. Excavator-controlling apparatus. Willard R. Ewing, Chicago, Ill., assignor to McWilliams Dredging Co., same place.

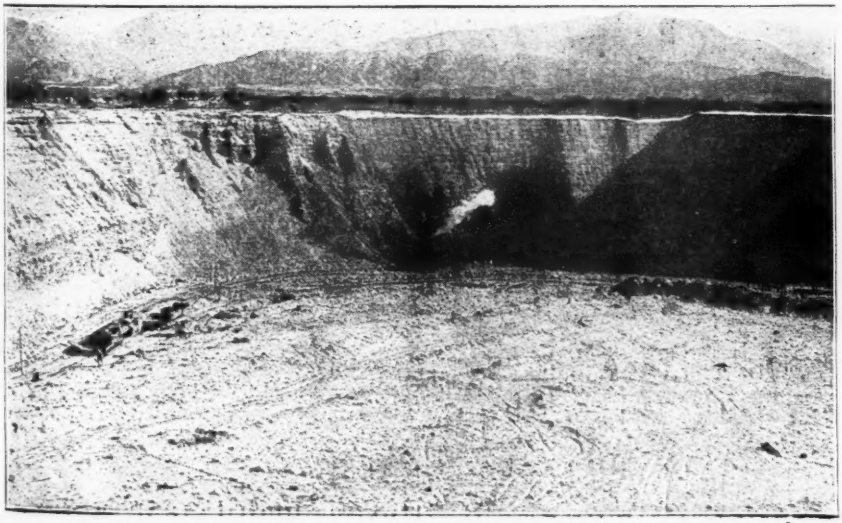
Developing a Failure Into a Success

By H. W. Munday

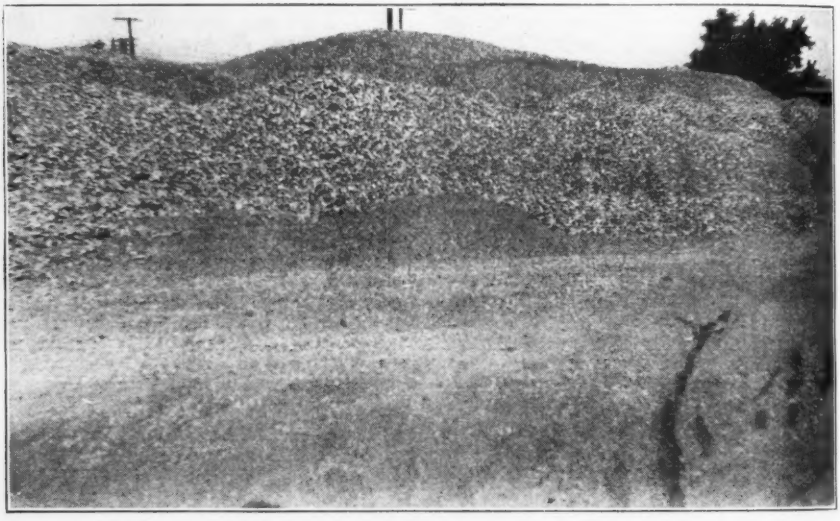
OPERATIONS producing sand, gravel and crushed stone in the Los Angeles, California, district were in a very unsettled state four years ago. Many plants were started and abandoned, probably to a more marked degree than in any other section of the country or at any other time. Conditions today are greatly improved. There have been several consolidations and more organization. During this period of unsettled conditions four years ago the Big Tejunga Rock and Gravel Company took over a plant which had not been profitable because of poor management and a layout inefficient for the prevailing conditions. Guy R. Varnum, President of this new company and an engineer, was quick to see the possibilities of an efficient plant. Undoubtedly the plight of the owners of the plant which was being considered made it possible to effect an excellent deal. In any event, the Big Tejunga Rock and Gravel Company took over the plant and entered the business, convinced that with some radical changes in methods a profitable enterprise could be conducted.

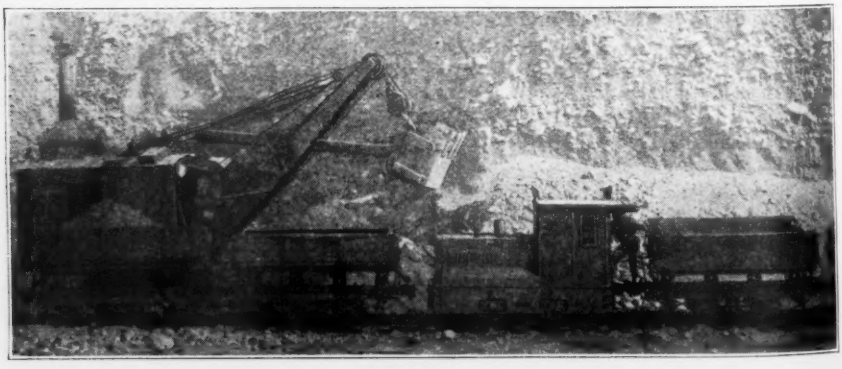
The original plant in 1921 was of the inclined railway type. The quarry car was loaded in the pit by Fresnos and discharged at the head of the plant into a hopper. This method was changed immediately. The plant was converted to a cableway excavating plant. A steel mast was erected, and a 1½ yard Pioneer bucket operated by a 150 h.p. Lidgerwood hoist was installed. This layout proved efficient, but the capacity was limited. By 1923 the market had grown tremendously, and a much larger plant was needed. It was determined that a plant with a capacity of 2000 tons per day would be necessary. In 1923 construction was started on the new plant, but the old plant was continued in operation during the time of construction of the new plant. A new deposit on the property, which would yield a larger percentage of gravel had also been discovered. By working down, the percentage of gravel either remained as high or increased. This plant has evolved into the present efficient operation.

The present deposit is on company property, which covers 90 acres. The material runs approximately 60 per cent gravel and 40 per cent sand. Test pits have shown that this material runs to a depth of at least 500 feet with little or no variation in percentage ratio. Water will not be encountered until a depth of 200 feet is reached; consequently the amount of

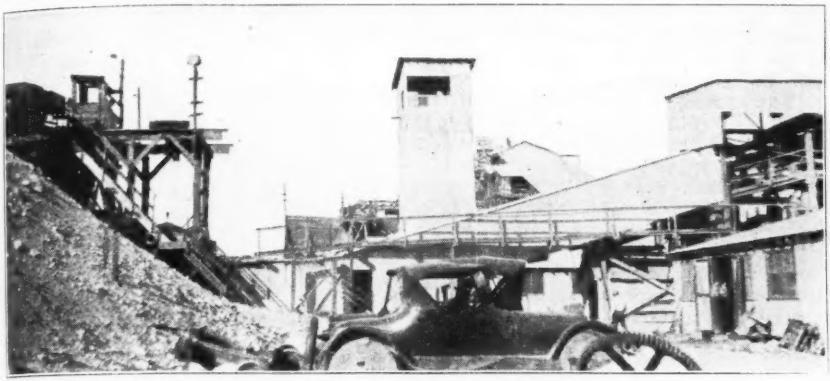


View of Deposit of Big Tejunga Rock and Gravel Company





Views of Deposits—Top View Shows Incline to Plant

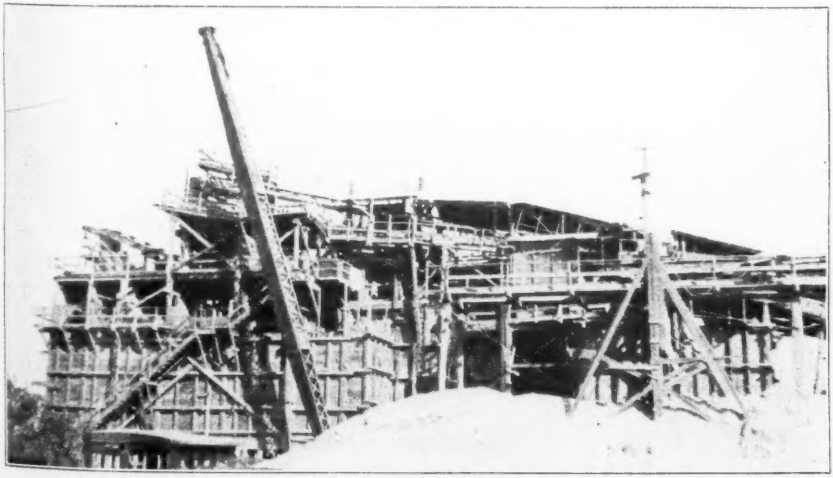


View of Scalping Plant

material available will last many years.

The open pit method is used. The face of this pit is about 80 feet high and has been opened in the shape of a crescent with double tracks and efficient switching arrangements. A Marion steam shovel with 1¼ yard bucket is used to dig the material and load it into 4 yard Western dump cars. Eight cars are in use at a time. While two are being loaded, two are being switched to position, two are going up the incline to the grizzly, and two are coming down. The movement of these cars is well timed and is one of the effective features of the plant. The arrangement balances with the rest of the plant neatly. Switching of these cars is handled by a 7 ton Plymouth gasoline locomotive. The cars are hauled to the foot of the incline by the Plymouth locomotive. A 150 h.p. 20x24 inch double drum hoist hauls the cars up this 1000 foot incline at the top of which they are discharged over a bar grizzly with 3 inch openings.

The oversize goes to a 28x36 inch Traylor primary crusher which discharges into a pit. This same pit receives the material which passes the bar grizzly. The material from the pit is conveyed by a 34 inch belt conveyor to a second bar grizzly with 3 inch openings. The material passing this grizzly goes to a 5x18 foot rotary scalping screen. The oversize from this second grizzly passes to a number 6 Allis-Chalmers gyratory crusher. This crusher discharges to a 4x12 foot rotary screen where the rock above



View of the Main Screening and Washing Plant

1½ inches is elevated to a chute which feeds a 48 inch Symons disc crusher. This same Symons crusher receives all the other material over 2½ inches.

The crushed rock is elevated to two 7x12 foot rotary screens by a 24 inch belt conveyor. These screens separate number one and two sizes and discharge them directly into the bins. All material ¾ inch and less falls onto a 22 inch belt conveyor which discharges to a double decked 4x10 foot Hummer vibrating screen. Sizes number three, four and dust fall by gravity to their respective bins. Another 24 inch belt conveyor, parallel to the crushed rock conveyor, delivers the sand and gravel to a 6x12 foot washing screen. The ¾ and ½ inch gravel, after being washed, falls by gravity to respective bins. The sand passes to three 16 inch by 18 feet log washers which discharge to bins or onto a tunnel which is equipped with two changeable discharge points.

Water for washing is secured from an 18 inch artesian well which is 422 feet deep. A Johnston deep well pump driven by a 200 h.p. Western gas engine supplies 1200 gallons of water per minute. This water is also available for fire protection. A water connection is also obtained from the Los Angeles aqueduct.

The total bin capacity is about 2000 tons. There is available outside storage space for at least 20,000 tons should such a stock pile be needed. Trucks or railroad cars are loaded directly from the bins. About 50 per cent of the business is handled by trucks. All trucks are weighed on Fairbanks Morse truck scales. The plant is operated electrically with the exception of the gas engine on the pump. The present plant capacity is 2000 tons per 10 hour day.

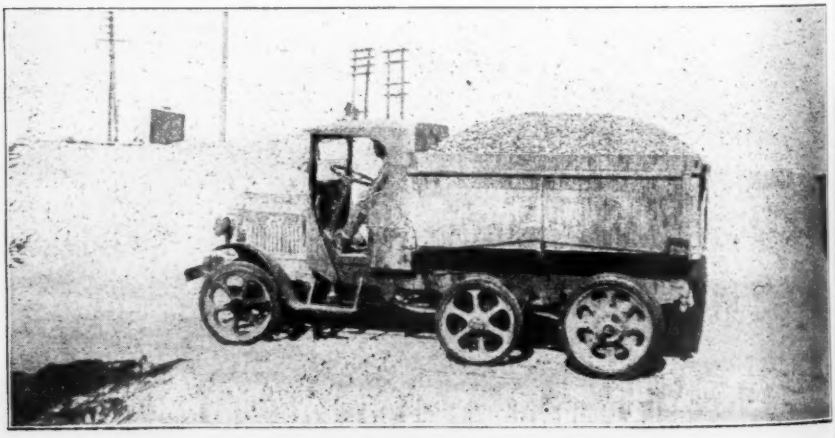
The executive offices of the company are in Hollywood, California. Guy R. Varnum is President of the company and Thomas F. Fournier is Treasurer. The present plant is a success, and its growth is, in fact, traceable to the experiences gained in operating the initial plant which was a failure.

Power Exposition

The Fourth National Exposition of Power and Mechanical Engineering will open at 2 P.M. on Monday, November 30, 1925, at the Grand Central Palace, New York City. It will extend through the week, ending December 5th, opening each day at noon.

The basic purpose of the Exposition is to bring together showings of manufacturers of power and mechanical equipment so that engineers and industrial executives may have an opportunity for comparative study of the outstanding developments in the field. The manner in which the Power Exposition has developed during the past three years is convincing proof that it is filling a useful place in the tremendous development in power generating and power using devices.

The Uehling Instrument Co., of Paterson, N. J. recently appointed the Ernest E. Lee Co., 115 South Dearborn St., Chicago, to represent them in Northern Illinois and Northern Indiana in connection with the sale of CO_2 Recorders.



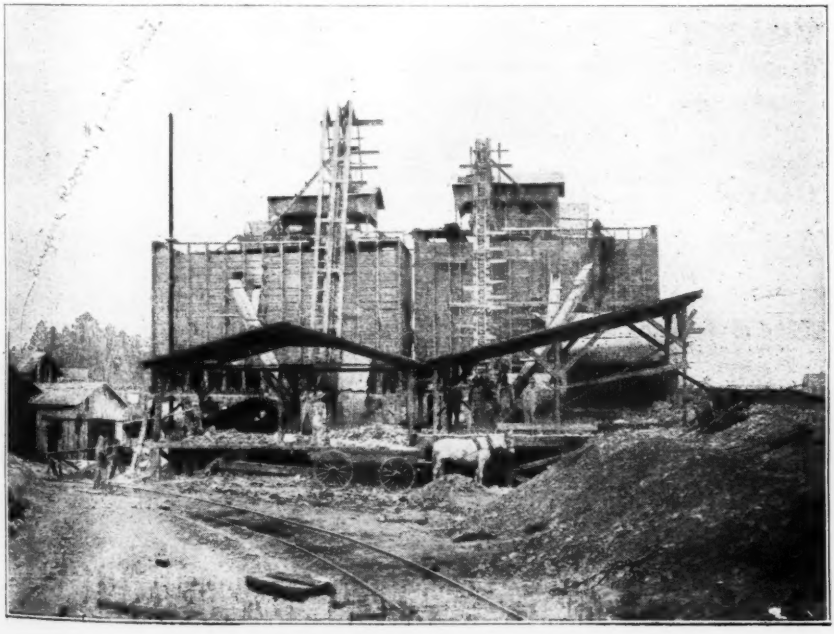
Type of Truck Used in Making Deliveries

Producing Crushed Stone in Florida Exclusively for Road Building

LIMESTONE, which has been specially designated by geologists as Ocala limestone, is produced by the Cummer Lumber Company at Kendrick, Florida. The company controls about 160 acres of land which aggregates about seven million tons of lime rock. This acreage necessarily is worked by more than one plant. Two crushed stone plants are operated on this deposit. The average analysis of this lime shows between 98.00 and 99.45 per cent carbonate of lime, about 0.16 per cent insoluble silicious matter, about 0.32 per cent oxide of iron and alumina, and about 0.7 per cent combined water and organic matter. The lime rock is used very extensively in Florida as a base for the general highways. It cements excellently and makes a strong and lasting road base; but the surface, after cementing, has to be treated or covered with asphalt to protect it.

Each lime plant is equipped with an 18x60 inch roll type crusher which is similar to the McLanahan Stone Machine Company's crusher. The crushers in the lime stone plants of the Cummer Lumber Company were built by the Ocala Iron Works. These crushers reduce the stone to less than six inches. The discharge from these crushers passes to other crushers of the same type but 18x36 inches, which reduce the stone to three inches and less.

In drilling operations in the quarry hand labor is used. A 1¾ inch sand jet drill is employed. Drilling operations cost about three cents per foot for this work. About one carload of dynamite is used per month in blasting operations. After blasting, the stone is loaded by No. 21 Marion steam shovels with ¾-yard buckets into 2-yard Koppel end dump cars. These cars are then hauled up an incline by a drum hoist and discharged into a hopper which feeds the primary crusher. These same methods are employed at both quarries. The Cummer Lumber Company is using 7 Marion number 21 shovels equipped with ¾-yard buckets in its quarry operations. Four of these are equipped



The Number One Crushing Plant

Narrow Gauge Track to Number One Plant

Crushed Stone Plant Number Two

Number One Crushed

with steel crane booms for clamshell, and all are mounted with crawling tractors. Two of these shovels are used in each quarry, while one is used in each quarry for removing overburden. The seventh shovel is kept on hand for miscellaneous work and for emergency should any of the other shovels be out of service for any reason. The overburden is loaded into 2-yard Koppel cars and hauled away to a dump.

In connection with these two quarries the company is operating two Acme jaw crushers for handling special products. One of these crushers handles flint rock which is gathered rounding country. This crusher has a capacity of 50 tons daily. The other has a capacity of 100 tons daily and is used in crushing a very hard crystallized limestone which overlies part of the deposit. Ordinarily this hard limestone would be discarded with the overburden because it is too hard for the roll crushers. One steam shovel handles this work, and when it produces a supply of such stone sufficient to keep the Acme jaw crusher working for some time, it is being used in removing overburden. The overburden runs from six inches to six feet in depth. It is pretty hard clay and usually contains flint boulders which are set aside for crushing. In one of the two plants an air compressor is used frequently in connection with the drilling operations when working on the hard crystallized limestone which is sent to the jaw crusher.

In one of the crushed stone plants a 100 H.P. Fairbanks Morse diesel oil engine operates the two roll crushers and the two bucket elevators from the jaw crushers to the screening plant. The other plant has an 80 H.P. Venn Severin oil engine for power. The screening plant consists of rotary screens which separate ¾-inch and 1½-inch stone. These screens are up above bins, and they discharge directly to separate bins. The rejects from these screens are sent back to their respective crushers. The bins have each a capacity of 250 tons. They are located directly over the railroad tracks and are high enough so that gondola cars can be loaded from them by gravity. The company is able to ship only over the line of the Atlantic Coast Line Railroad. This fact embarrasses the plant somewhat as the service is such that the plant is seldom able to produce capacity because of the poor shipping facilities. The combined capacity of the two plants is 3,000 tons a day. The rock is sold exclusively to highway contractors for use as base material in building highways.

A small machine shop and also a blacksmith shop are maintained at one of the plants. It is necessary, however, to send any special or heavy work or castings to the local shop in Ocala or Jacksonville.

The Board of Managers of the Cummer Lumber Company includes Messrs. Coit, Lloyd and Mathias.

The Coon De Visser Co. who have been representing the Uehling Instrument Co. for several years in Michigan have just moved from 1172 West Lafayette Boulevard to 2051 West Lafayette Boulevard, Detroit, Mich.

e Crushed Quarry

Erie Centrifugal Pumps

Erie centrifugal pumps are built either single or multistage, with horizontal or vertical shafts, open or enclosed impellers, with a wide range of capacities for low, medium or high heads, applicable to nearly every kind of pumping service. The Erie single suction pumps, types O and E, are built in sizes from 1 inch to 6 inch discharge inclusive with capacities from 10 to 1,400 gallons per minute, pressures up to 43 pounds per square inch or about 100 feet total head. The design is according to the latest and best engineering pump practice; ring-oiling bearings, balanced rotating element, efficient and quiet in operation. Type O has an open impeller and will handle, without clogging, liquids containing a certain amount of solids in suspension, such as are encountered on construction, drainage and sewerage jobs. Type E has an enclosed impeller for clear, roily or turbid liquids free from grit. They are built for any type of direct drive with speeds up to about 2,000 r.p.m., and for belt drive.

The Erie double suction, horizontally split shell pumps, type S, are adapted to pumping clear or roily liquids free from grit up to 180 feet head depending on the size of pump used. Sizes range from 2 inch to 16 inch discharge inclusive and capacities from 50 to 10,000 gallons per minute. The split shell construction makes it possible to inspect or replace any working part without disturbing pipe connections. The pumps have split removable bearing shells, bronze shaft sleeves, ring-oiling bearings, removable wearing rings, a bronze impeller hydraulically and mechanically balanced, and the impeller design prevents overload of driving motor under reduced head. These pumps are built for any form of direct drive with speeds up to about 2,000 revolutions per minute and for belt drive.

Erie multistage horizontally split pumps, type MS, are suitable for pumping clear liquids against high pressures up to 225 pounds per square inch, size ranging from 1½ inch to 6 inch discharge inclusive in 2 to 6 stages and capacities from 10 to 1,400 gallons per minute. They are built for any type of drive at speeds up to about 3,000 r.p.m. and also for belt drive.

The gasoline engine driven pump unit is for fire protection where dependability counts. It is bronze fitted throughout, capacities 250, 500, 750, and 1,000 gallons per minute against pressures up to 150 pounds and designed for direct connection to electric motor, steam turbine and gasoline or oil engine.

Erie class D pumps are built for hardest service in handling sand and gravel. They are especially developed for handling liquids with abrasive solids in suspension and have been successfully used for over thirty-five years on this kind of work. Standard dredge pumps are designed for pumping heads up to 50 feet; medium duty pumps for heads from 50 to 70 feet; and high duty pumps, with water cooled ring-oiling or forced feed lubricated marine thrust bearings, for heads from 70 feet up to 120 feet.

Sizes range from 2½ inch to 18 inch discharge, inclusive, pumping from 250 to 7,000 gallons per minute, or capacities in solids from 7 to 2,000 cubic yards per hour. They are built for belt or chain drive, or direct connection to steam engine, electric motor, gasoline or oil engine. The water passages through pump and impeller have been especially designed for smooth operation, to eliminate wear and vibration, thus insuring long life.

Climax Appoints New Agencies

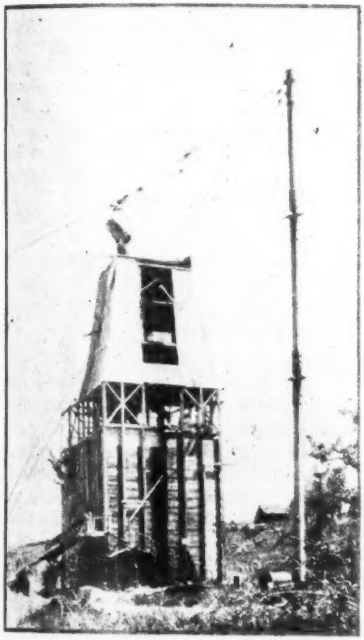
The Climax Engineering Company, Clinton, Iowa, announce the appointment of the Coast Machinery Corporation, 829 Folsom Street, San Francisco, California, as sales representatives for Northern California. The Coast Machinery Corporation have been handling the sale of Climax Trustworthy Engines in Los Angeles and will now cover the entire state of California. Mr. Ed. Crowley, who recently was general sales manager of the Climax Engineering Company, is the President of the Coast Machinery Corporation. His intimate knowledge of Climax engines will be of undoubted advantage to California users. A stock of repairs and units sufficient to take care of requirements will be carried at San Francisco. The Climax Engineering Company, Clinton, Iowa, also announce the appointment of a number of other new dealers.

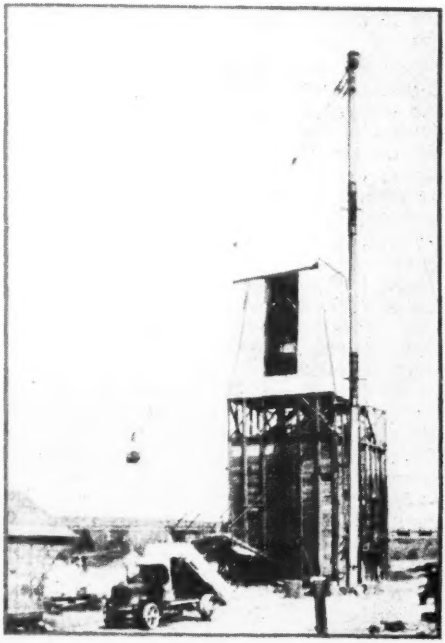
The George W. Whitehead Company, 61 The Terrace, Buffalo, New York, is handling engine sales in Buffalo and Western New York.

Doing an Annual Business Six Times the Capital Invested in Plant

SMALL sand and gravel operations frequently represent efficiency in layout and management to a marked degree. Such is the case of the operations conducted by Service Brothers of Waterford, California.

This firm is a partnership of three brothers with one, L. E. Service in active charge. The Service Brothers commenced operation five years ago. The original set-up is still in use. The first plant was at Sacramento. It was then moved to Ceres and finally to its present site at Waterford. The present deposit is located on the Toulomne River at Waterford. The river ma-





Views of Service Brothers Plant

terial runs about 70 per cent gravel and 30 per cent sand. This ratio is a fortunate circumstance as it is difficult to dispose of all the sand. The market is confined largely to a radius of twenty miles from the plant and is served efficiently by the company's fleet of five White trucks. The average haul is eight miles, and in most instances is over concrete highways. There is no occasion to make railroad shipments. The average production is 200 yards per nine hour day. The material passes all tests and specifications and more than 75 per cent of the output is used in concrete construction.

The plant itself is interesting. A Sauerman 1 cubic yard slackline cableway operated by a 75 h.p. special Sauerman two speed hoist excavates the material. All the material is stream gravel and practically all under water. There is no clay or loam to worry about. The cableway mast is 105 feet high and is made of Oregon pine, three piece spliced 16x16 square, and well trussed. The inhaul line is 1¼ while the return is ¾ inches. The screening plant consists of three screens. The primary screen is directly under the dump bin at the top of the plant. This screen is revolving and of 36 inch diameter. An inch and a quarter wire mesh screen is used on this screen. Wire mesh screen is used because it is necessary to produce many different sizes of material and it is advisable to keep the plant investment at a minimum.

The rejections from the primary screen fall directly to a number 3 Austin crusher. From this crusher the discharge falls by gravity to a dry screen on the second floor of the plant. This dry screen separates out the ⅜, ⅝ and one inch sizes. The material which passes the primary screen is delivered to a wet screen which is parallel to the dry screen on the second floor. This screen separates the sand and the ¼, ⅝ and 1¼ inch sizes. The rejects from both the wet and dry screens on the second floor pass by gravity to a Wheeling number 2½ secondary crusher. The discharge from this crusher is fed to a continuous bucket elevator which discharges into the dry screen for sizing. This elevator is the only one in the plant. Water for washing is furnished by a pump direct connected to a 10 H.P. motor. There is a connected load of 147 H.P. The power bill runs between $55.00 and $90.00. The irrigation district here owns its own power plant and so Service Brothers secure their power for 8½ mills per kilowatt. This plant is located in the heart of three irrigation districts, and this work affords a worthwhile market in the winter and early spring. During the late spring and summer the building construction market takes all the plant output. The fall opens the concrete mix and bridge work.

The plant represents a capital investment of $30,000 exclusive of the truck equipment. Production this year will exceed 60,000 yards which are being sold at an average of $3.25 per yard delivered. The fact that a small plant with an invested capital of $30,000 can do an annual business of about $180,000 is interesting. It shows clearly that efficiency exists in the plant and its management.

It Is a St. Marys Oil Engine

McKoon Quarry at Santee, California, which was discussed in the September 15th number of Pit and Quarry, solved its power problems with an oil engine which is manufactured by the St. Marys Oil Engine Company. This oil engine, which is a 75 h.p. full diesel type, handles the service, which with the normal hookup would require two electric motors of 75 h.p. each, and performs this service at a cost of $2.50 per day for fuel and oil. The oil engine was installed with the shafting arranged so that the fuel power of the engine can be used either for hoisting or operating an air compressor.

Shreveport Gravel Expanding

The Shreveport Gravel Company is operating a plant at Latonia, Louisiana, about five miles south of Sibley on the Sibley, Lake Bisteneau and Southern Railway. This company mines sand and gravel from a creek bottom, while practically all the operations in this section produce from banks.

At the present time gravel is loaded with a six inch Amsco pump. An additional barge and an eight inch Amsco pump are being installed. The officers are Fordyce Kimball, President; J. Kreubbe, Vice President; C. S. McFarland, Secretary Treasurer; and C. H. McFarland, Superintendent.

A New Truck and Trailer Crane

A new truck and trailer crane is now being placed on the market by the Harnischfeger Corporation, (formerly Pawling & Harnischfeger), of Milwaukee, Wisconsin. This crane—known as the P&H Model 203-A Truck Crane—is the final result of a long series of tests and developments made by the P&H Engineers, and the machine now embodies the valuable combination of speed, compactness, light weight, sturdiness and complete accessibility. The great value of these features are better realized when considered along with the advantages which they give in the operation of this crane.

The speed of this crane can be especially appreciated when moving between jobs. The truck or trailer mounting enables it to move at regular truck speed, thus cutting down the inactive time to a minimum. This is especially advantageous when there are a number of jobs, all at different points. When on the job, it is equally fast in operation—having a line speed of 125 feet per minute and a swing speed of 5 r.p.m.

Compactness is achieved mainly by the simple arrangement of having all three drums mounted on one shaft. The hoisting and digging drums are mounted side by side and the boom hoist is placed on the end of this shaft, at the left side of the machine. This arrangement of machinery makes it possible to have every piece of main machinery behind the center pin, thus giving better balance and eliminating the necessity of a large amount of counterweight (only 1000 lbs. being used). A more concise idea of the compactness of this machine may be gained from the fact that there are only four shafts on the whole machine and only eleven main gears and a set of planetary gears. Simplicity is thus combined with compactness. This type of construction gives the very short tail swing of 7 feet 1½ inches and an overall width of 8 feet 4 inches. Thus the machine is able to work in very close quarters or to travel in very narrow alleys wtihout interference.

The light weight of this machine is realized at once from the total weight of 13,000 lbs. This weight includes the entire crane equipment with the structural frame which fits on the truck, but does not include the weight of the truck.

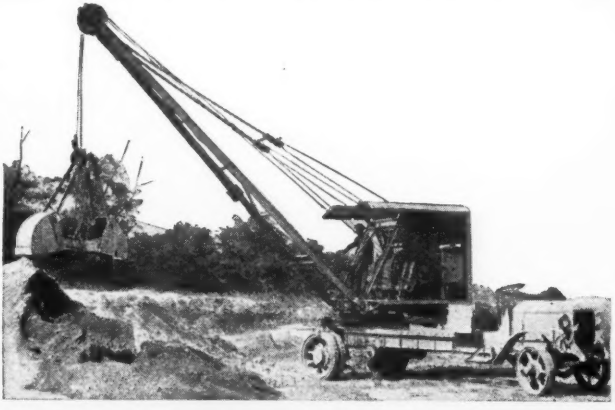
This light weight makes it possible for a 5 or 7½ ton truck to handle the crane and also reduces the danger of miring in soft ground.

Sturdiness on this truck crane is obtained by cast steel revolving frame, cast steel drum bearing frames, heavy swing gear with I-beam spokes and outside teeth. Thus there are no rivets to work loose and the frames are always rigid.

The accessibility of this machine is as complete as possible. Any shaft on the machine can be removed without disturbing those adjacent. Every gear and bearing can be readily reached for lubrication and care. The revolving rollers can be removed from the top of the frame without jacking up the machine. Drum clutches and all brakes are of the outside band type, making adjustments and renewals very easy.

This machine is built to handle a ½ yard clamshell bucket on a 25 foot boom, or for lifting 10,000 lbs. at 10 feet radius.

The machine is driven by a 4-cylinder, 40 hp. motor, which operates at a governed speed of 1,000 r.p.m. The motor is placed at the rear of the revolving frame and is entirely accessi-



The New P. & H. Truck and Trailer Crane

ble for care and operation. The radiator is of the casttank type, with a corrugated core of large frontal area. A centrifugal pump is used for forced circulation. Motor lubrication is by pressure feed to all main and connecting rod bearings—a geared pump with removable screen being used. The gasoline tank is a steel drum, of 20 gal. capacity, fastened to the rear of the "A" frame.

The motor clutch is Twin Disc type, fully enclosed and supported in ball bearings. All the gears are made of high grade steel with double cut teeth. The first reduction gears are enclosed and run in light grease.

The two main drums are mounted side by side on the drum shaft and are controlled by independent clutches and brakes. Both drums run at the same speed, making it possible to use a clamshell bucket without special attachments and making it possible to open or close the bucket at any point. The drum clutches are controlled by the P&H Patented Power Clutch Control which causes the motor to do the heavy work of operating the clutches.

The boom hoist is located on the main drum shaft and is driven by plantetary gears at a line speed of 62½ feet per min. In lowering, the line speed cannot exceed 125 feet per min. because of a self locking connection to the drum shaft. Thus it is impossible to drop the load unless the cables part. A large outside band brake is provided for locking the boom hoist. This boom hoist can be operated at the same time as, or independently from, the main drums and swinging machinery.

The four main levers are grouped in a unit stand at the right hand, front of the machine, enabling the operator to sit and face the work, as well as see the operating machinery.

The revolving frame is a one piece stele casting, heavily ribbed, providing a very rigid base for all machinery. The swing gear is of large diameter and has outside, non-cloggable teeth. A special structural frame is provided for fitting on the truck.

When the trailer mounting is used, the advantage of mobility is possessed as well as the additional advantages that it releases a truck for hauling services and requires a considerably smaller investment. The trailer crane is provided with mechanism to propel itself at a speed of 1¼ miles per hour when on the job. This is accomplished by a center drive shaft and two driving chains, connected by jaw clutches to the drive shaft. Brakes are also provided to hold the machine in position. All control of these clutches and brakes is centered on the upper frame convenient to the operator.

On both truck and trailer cranes, jacks are provided which screw down against the rear wheels. These relieve the springs of all load when the crane is operating. Chains pass from the jacks, around the wheels, acting as rebound snubbers. An all steel canopy and back shield with heavy canvas curtains is provided as standard equipment.

This truck and trailer crane may be equipped with clamshell or dragline bucket, crane hook, electric magnet or pile driver and thus may be used for a wide variety of purposes. Handling coal, sand, gravel, pipe, poles, lumber, stones, snow, iron, coke or steel is only a part of the many duties which may be performed by this machine.

New Heil Building

The new Heil administration building which is now in the process of construction will be completed before the first of the year. It will be occupied by the executive, sales, advertising, accounting, purchasing and engineering departments of The Heil Company general offices of Milwaukee.

The building is early colonial in design. It is 40 feet wide, 120 feet long, and 40 feet high. The basement has been especially designed to accommodate a showroom for Heil products.

An inclined driveway permits easy accessibility to the basement. The latest models of Heil dump bodies, hoists, and tanks for motor trucks will always be kept on exhibition for the convenience of visitors.

The first floor of the building will be entered through an impressive lobby finished in door-high wainscoting. Two rooms will lead off from the lobby to be used for conferences. The telephone switchboard and information desk are in the lobby. The sales, advertising, and accounting departments will be located on the first floor.

The executive offices of The Heil Company will be on the second floor. The engineering and stenographic departments will also be located there.

The entire building has been designed by the architect to allow for maximum daylight lighting.

FOR SALE OR RENT

STEAM SHOVELS—Railroad Type

(Note:—All Railroad Type Steam Shovels can be furnished on full caterpillar mountings if desired.)

1—95-C Bucyrus. Shop No. 1235, 4-yd. or 5-yd. dipper.
1—Model 80 Marion. Shop No. 1312, 4-yd.
1—Model 75 Marion. Shop No. 2112, 2½-yd. or 4-yd. dipper.
1—70-C Bucyrus. Shop Nos. 1197, 2½-yd. dipper.
4—70-ton Bucyrus. Shop Nos. 920, 939, 977 and 1233, 2½-yd. dippers.
5—Model 60 Marion. Shop Nos. 1301, 1995, 1999, 2059 and 2238, 2½-yd. dippers.
2—60-C Bucyrus Shop Nos. 1286 and 1388, 2½-yd. dippers.
1—45-C Bucyrus. Shop No. 1201, 1¾-yd dipper.

STEAM SHOVELS—Full-Revolving

1—80-B Bucyrus Caterpillar Type Steam Shovel. Shop No. 4002—New November, 1923. Equipped with 41-ft. 6-in. boom, 26-ft. dipper arm and 2½-yd. dipper.
1—Model 36-Marion. Shop No. 4727, 1½-yd. dipper, Caterpillar.
2—Model 31-Marion. Shop Nos. 3341 and 3613, 1-yd. dipper. Traction wheel or railroad truck mounting.
1—18-B Bucyrus. Shop No. 1870, ⅞-yd. dipper. Traction.
2—Type "B" Erie. Shop Nos. 1484, 1880, Caterpillars, high lift, ¾-yd. dippers.
1—Type "B" Erie. Shop No. 3047. New 1924. Caterpillars. ¾-yd. dipper
1—Type "B" Erie. Shop No. 559. New A.S.M.E. boiler. Standard boom, ¾-yd. dipper. Traction or railroad mounting.

SIDE DUMP CARS

2—20-yd. Western All-Steel Air Dump Cars, vertical cylinders.
18—16-yd. Western Air Dump Cars.
7—12-yd. Western Air Dump Cars, 19-ft. beds, box girder doors.
10—12-yd. Western Air Dump Cars. 19-ft. beds, box girder doors. Vertical cylinders. located, Opeklika, Ala.
2—12-yd. Western Hand Dump Cars, 19-ft. beds, box girder doors.
15—12-yd Western Air Dump Cars, Truss-rod doors, 26-ft. beds.
3—12-yd. Oliver Hand Dump Cars.
2—8-yd. Western 36-in. ga., double trucks.
10—6-yd. K. & J. Steel Sills, Truss-rod doors. Steel lined floors. Located Burnaugh, Ky.
27—6-yd. Continental, steel sills, wood beds, Automatic couplers.
5—4-yd. Western Heavy Duty. 36-in. gauge. Steel lined floors.
8—2-yd. Western, 36-in. gauge.
51—1½-yd. Western, 24-in. gauge.

SPREADER CARS

2—Std. gauge Western Spreader Cars.

STEAM SHOVEL PARTS

1—Boom for Marion 60 or 61 Shovel, length 35-ft. 22-ft. dipper arm, 1½-yd. dipper, long jack arms, etc.
1—19-ft. 6-in. boom. 12-ft. sticks and ditcher bucket for Type B Erie Shovels.
1—22-ft. dipper stick for Type B, Erie Shovel.

LOCOMOTIVES—Standard Gauge

1—19x24 Baldwin 6-wheeled S. T. Shop No. 49553, built 1918. Weight 67-tons, air brakes, 180 lbs. steam pressure.
1—14x20 Vulcan 4-wheeled Saddle Tank. Shop No. 1741. Weight 38 tons. Ohio boiler. 165 lb. pressure.
3—11x16 Davenport 4-wheeled Saddle Tanks. Shop Nos. 1938, 1939 and 1951. New 1923. A.S.M.E. boilers carrying 170 lb. pressure. Steam brakes.

LOCOMOTIVES—36-in. Gauge

1—9x14 Vulcan Dinkey. Shop No. 1675. Weight, 14 tons.
2—7x12 Davenport, 4-wheel Saddle Tank. Shop Nos. 1566 and 1567.
1—9-ton Whitcomb Gasoline Locomotive.

LOCOMOTIVES—24-in. Gauge

3—7x12 Davenport Dinkies. Shop Nos. 1202, 1411 and 1524. Weight 9 tons.
1—6x10 Davenport Side Tank Dinkey. Shop No. 1307. Weight, 7 tons.
1—6-ton Whitcomb. Shop No. 1259. Gear drive. Gasoline.

DRAGLINE EXCAVATORS

1—Class 24 Bucyrus Steam. Shop No. 903, skids and rollers, 115-ft. boom; 3½-yd. Page bucket.
1—Class 14 Bucyrus. Shop No. 3387. Caterpillars, 60-ft. boom, 2-yd. Page bucket. Located Windsor, Conn.
1—Class 14 Bucyrus. Steam operated. Shop No. 748. Caterpillars. 60-ft. boom, 2-yd. Page bucket.
1—Monighan No. 2. Shop No. 789. Skids. 60-ft. boom, 2-yd. bucket.
2—30-B Bucyrus. Shop Nos. 3640 and 3641. Caterpillars. 40-ft. booms, 1-yd. bucket.

CRANES

1—Type "B" Erie. Shop No. 559. Traction or railroad truck mounting. 32-ft. boom. Bucket-operating.
1—10-ton Industrial, 4-wheeled. Shop No. 1989, 40 ft. boom. bucket operating.
1—15-ton Ohio. Shop No. 3441. 8-wheeled, M.C.B. trucks. 40-ft. boom, with 10-ft. extension, bucket-operating drums, 1-yd. bucket.
1—20-ton McMyler, 8-wheeled. Shop No. 388, 45-ft. boom, 1¼-yd. O & S clam.
1—Gantry Crane. New in 1919; 48-ft. boom, 15-ton cap., at 18-ft. radius; 7-ft. 10½-in. gauge. 12-ft. wheelbase, self-propelling. base of boom 17-ft. above track. Bucket-operating drums. Weight, 50 tons.

BUCKETS

1—1-yd. Class "M" Page Dragline.
1—1½-yd. Class "S" Page Dragline Bucket.
1—2-yd. Class "S" Page Dragline Bucket.
1—2-yd. Class "M" Page Dragline Bucket.
1—3½-yd. Class "C" Page Dragline Bucket.
1—¾-yd. Lakewood Clam Shell.
1—¾-yd. Williams Clam Shell.
1—1-yd. Browning Clam Shell. Reeved type.
1—1¼-yd. Williams Hercules Clam Shell.
1—1½-yd. Brown Hoist Clam Shell.
1—1¼-yd. Williams Favorite.
3—Mead-Morrison 1½ yd. Clam Shells.
2—1¼-yd. O. & S. Coal Loading Clam Shells.

MISCELLANEOUS

1—10-ton Buffalo-Springfield Roller. Shop No. 10707 with scarifier.
2—36-ft. Camp Cars. 80 000 cap.
1—American Railroad Ditcher No. 459.
1—8-ft. Austin Road Grader.
1—6x10 D.C., D.D., Lidgewood Hoist, with 36x90-in. boiler.
1—6½x10 D. C., D. D. American Hoist, with butt strapped boiler.
1—7x10 D. C., D D. Lambert Hoist, without boiler.
1—7x10 D.C., D.D. Flory Hoist, without boiler.
1—Lambert 8½x10 Double Drum with boiler.
16—No. 8 Milburn Carbide Lights, 8000 Candle Power.
4—No. 12 Milburn Carbide Lights, 12,000 Candle Power.
9—Milburn Reliance Carbide Lights, 1,000 Candle Power.
6—Milburn Builders Carbide Lights, 500 Candle Power.
1—No. 55 Buhl Portable Air Compressor.
13—No. 90 Buhl Portable Air Compressors. New.
1—20-hp. Upright Boilers.
1—No. 10 Byers Semi-Caterpillar Steam Crane, 40-ft. boom, ¾-yd. Blaw-Knox bucket, practically new.

COMPRESSORS

1—Ingersoll Rand air compressor, 12x10 belt driven 325′ capacity; 60 H. P. motor, with receiver, mounted on wheels.
1—Chicago Pneumatic air compressor, 12x10 belt driven 325′ capacity; 60 H. P. motor.

HOISTING ENGINES, ELECTRIC

6—37 H.P. American d.d., with attached swingers, A. C. motors.
1—30 H.P. Lambert double drum, A. C. motor.
1—75 H.P. Clyde triple drum, attached or independent swinger A.C. motor.

GASOLINE

2—50 H.P. American d.d. with attached swinger, new gasoline engine.
2—30 H.P. Lambert d.d., equipped with new gasoline engine.

STEAM

1—Lambert 9½x12 triple drum with butt strap boiler and 6¼x8 independent swinger.
2—Lidgerwood 8¼x10 d.d. with attached swinger and boiler.

DERRICKS

1—Terry 15 ton stiff leg derrick, 3 line service, 65′ steel boom.
10—American stiff leg derricks, 14x14 timbers, 12′ steel bull wheel, 65′ boom.
5—3 ton jinniwinks.

MISCELLANEOUS

10—Ingersoll Rand "Little Tugger" air hoists.
4—Ingersoll Rand No. 248 Leyner drills with tripods.
Steam pumps; centrifugal pumps; chain blocks—1 to 20 Tons.

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Hudson Terminal Bldg., New York City

Construction **WE BUY—SELL—TRADE—RENT** Equipment

CRANES

1—Erie "B" 32-ft. Boom.
1—O & S 12-ton Cat., Gas Power, 50-ft. Boom, 1-yd. Bucket.
1—Northwest Mod. 104 Caterpillar.
1—Erie "B" Caterpillar.
2—No. 8-C 8-wheel Browning Loco. Cranes.
1—Marion 21 Steam Crane on Cat.

LOCOMOTIVES

1—24 Ga. Plymouth Gas Power.
2—36-in. Ga. Porter, 18-ton Saddle Tanks.
4—St. Ga. from 20 to 50 tons.

SHOVELS

1—Type "B" Erie Full Cat.
2—Model 4 Keystone Excavators.
22—Marion and Bucyrus, mounted on Cat. Trac. Wheels and R. R. Type from ¾ to 4-yd. cap.
1—Marion 37 on Cat. with 1¾-yd. Dipper.

DRAGLINES

10—Dragline Outfits, including Monighan, Bucyrus, Fairbanks, Morse and Marion, ranging from ¾ to 4-yd. cap.
1—Marion 21, Steam Cat.
1—Monighan, 1½-T Walker Type.
1—Monighan 2-T Walker, Oil Engine Drive.
1—Monighan 3-T Walker, Diesel Engine Drive.

HOISTING ENGINES

2—8¼x10 D/C D/D's with Boilers.
8—7x10 D/D's Am. La. Ldg. Mundy.
1—8¼x10 3-D Stroudsburg.
1—7x10 3-D Stroudsburg.

MISCELLANEOUS

1—1-yd. "E" Hayward Clam Shell.
1—No. 5 Gates Gy. Crusher.
1—80-hp. Loco. Type Butt Strap Boiler.

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1 Rotary 7-5½x60 feet. Operated only few days.
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1 No. 3, Williams
1 Style 7 Kent Maxecon
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ROTARY DRYERS

3 6x60 foot 1 6x50 foot 1 6x40 foot

CRUSHERS

1 20x26 Universal Jaw.
1 No. 7½ Kennedy. Built by Chalmers & Williams.
1 No. 6 McCully. Rear Drive.
1 No. 1½ Sturtevant Rotary Lime.

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1 6x22-foot 2 Compartment, "Power and Mining."
1 6x18-foot. Silax lined.
1 4x16-foot, Schmidt. Silax lined.

LOADING MACHINE

1 No. 4 Myers Whaley

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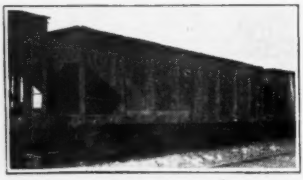

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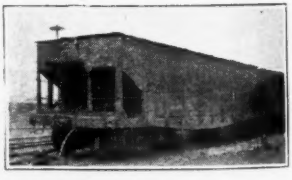

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Sheaves—New metal bushed 11" $5, 13" $6, 16" $7, 19" $10.
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1205 cu. ft. Ingersoll-Rand, compound steam, 2-stage air, 100 lb. pressure; complete unit mounted on cast iron subbase which also contains intercooler. $1500.00. First-class condition.

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One Croker-Wheeler Condenser, 625 K. V. A., 720 R. P. M., 440 Volts, 60 Cycle, 3 Phase, Separately Excited.

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LOCOS.—2 six wh. Amer. Switchers.
19x24, wt. 50 ton, 165 lb.
Baldwin Mogul 45 ton, 140 lb.
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Draglines—Bucyrus 24—115' B. 3½ yd.
Shovels—Marion 250—Bucyrus 225—175B.
2 Bucyrus—1 Marion 65 ton RR.
Marion 37—Erie B Cater.
Crushers—Kilns—Jack Hammer Drills.
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Byer's No. 3 with caterpillars under derrick end, 30 ft. boom, ¾-yd. bucket. Used 3 months. (Cost $5,165). Sell $1,250 on cars. A real bargain.

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Railway Type, Mang. Dippers

Crushers #10, 9, 8, 7½, 6, 5, 4, 3,

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84x72, 36x60, 54x24, 18x30

Jaw Crushers

22x52", 36x42", 42x48", 20x24", 15x36"

DISC CRUSHERS. 48", 36", 24", 18"

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50-75-100-200-500-650 H.P.

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800 ft. span cable way complete with Lambert engine.

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5½"x8" American D.C. D.F.D. with boiler.
7"x10" D.C. D.F.D. with boiler.
8¼"x10" Lidgerwood D.C. D.F.D. with boiler.
7¾"x10" Mundy with boiler (New).
8¼"x10" Mundy with boiler (New).

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550 cu. ft. Ingersoll-Rand belted.
350 cu. ft. Ingersoll-Rand steam-driven.
8"x8" belted.

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1—36"x48" Traylor Jaw.
1—No. 9 Gates, manganese fitted.
1—No. 8 Gates, chilled iron fitted.
3—Simons Disc, 48", 24" and 18".
1—24"x36" Farrell.
2—24"x36" Carroll, manganese fitted.

SHOVELS

1—Marion Model 37 Electric.
1—Marion Model 32, caterpillar.
1—Erie, type B, combination.
1—Marion Model 28, two booms.

CRANES

1—22 ton O. & S. with 50 ft. boom.
1—Northwest Model 105, combination shovel and crane.
1—O. & S. 7 ton, gas, caterpillar.
1—10 ton Byers, traction.
1—10 ton O. & S. traction, 40 ft. boom.

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CRANES

McMyler, 25 ton 8 wheel, 50-70 ft. Boom.
Browning, 15-20 ton, 8-wheel, 50 ft. Boom.
Byers Model 10, Gas. Cat. ¾ yd. Bucket.
O. & S. 12 ton, Gas. Cat. 1 yd. Bucket.

SHOVELS AND DRAGLINES

Bucyrus 175B, 3½ yd. Dipper, A-1.
Marion 76 R. R. type 3½ yd. Dipper.
Bucyrus, 20 B, Cat. High Lift.
Bucyrus 14B Cat., ¾ yd.
Osgood 18 Caterpillar, ¾ yard.
Bucyrus 14 Dragline, 60 ft. Boom, Caterpillar.
Marion 21 Dragline Caterp. ¾ yd.

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Gyratory Crushers, various sizes.
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WE OWN and WANT TO SELL

2—Porter 18 ton locomotives, Nos. 3909 and 4258.
20—Dump cars, 36" ga. 4 yd. steel plates in beds.
150—Tons 55lb. rail with switches, splices, bolts and ties.

ALL ABOVE EQUIPMENT IN FIRST CLASS CONDITION, SHIPMENT FROM SOUTHERN ILLINOIS.

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1—Thew steam shovel No. 2269, roadwheels, late model, high lift with ¾ yd. dipper.
2—Plymouth Gas locomotives, 24" ga.

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92 ft. Ingersoll-Rand, ER-1, Belted.
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1145 ft. Chicago Pneumatic OCB, Belt.
1400 ft. Chicago Pneumatic, OCB, Belt.
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2—4 Drum McMyler Shaft Hoists.
1—7E Dake Hoist, 30 H.P.
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5—4 yd., 36 in. Gage Dump Cars
1—10 Ton Buffalo—Springfield Roller
1—3½ Ton Tandem Roller
18 in. and 24 in. Conveyor Belt and Idlers.
2—28-S Ransome Concrete Mixers.
1—Tank Wagon.
12 in. and 14 in. Centrifugal Pumps.
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Derricks, 2 and 3 Drum Hoists.

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15-ton, 4-wheel, steam operated, 45' boom, for bucket operation. Used one year. Three years old. EXCELLENT CONDITION. Original sales price, over $8,000. $3000 with commission.

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Steam Driven 8x8x8 and 10x10x10 Laidlow 116'x200'.

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Any Quantity—Immediate Shipment
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Steel Ties—Frogs—Switches, Etc.

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1—Model 70 Bucyrus Steam Shovel.
1—Model "O" Thew Revolving Shovel.
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